

The Battle Command Sustainment Support System: The Army's Command and Control System for Logistics

**A Monograph
by
Major Thomas E. Sachariason
U.S. Army**



**School of Advanced Military Studies
United States Army Command and General Staff College
Fort Leavenworth, Kansas**

AY 2008 - 2009

REPORT DOCUMENTATION PAGE				Form Approved OMB No. 0704-0188	
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing this collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports (0704-0188), 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.					
1. REPORT DATE (DD-MM-YYYY) 21-05-2009		2. REPORT TYPE SAMS Monograph		3. DATES COVERED (From - To) July 2008 – May 2009	
4. TITLE AND SUBTITLE The Battle Command Sustainment Support System: The Army's Command and Control System for Logistics				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S) Major Thomas E. Sachariason (U.S. Army)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) School of Advanced Military Studies (SAMS) 250 Gibbon Avenue Fort Leavenworth, KS 66027-2134				8. PERFORMING ORG REPORT NUMBER	
9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) U.S. Army Command and General Staff College ATTN: ATZL-SWD-GD 100 Stimson Ave. Fort Leavenworth, KS 66027-2301				10. SPONSOR/MONITOR'S ACRONYM(S) CGSC	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION / AVAILABILITY STATEMENT Approved for Public Release; Distribution is Unlimited					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT Army commanders on the battlefields in Iraq and Afghanistan lead their forces using a computer-enhanced communications network allowing them to stay connected with dispersed elements and maintain a high level of situation awareness (SA) of their subordinate's operations. However, does the Army have a sufficiently capable computer system for logistics? Is the Army ensuring the system selected provides value added to commanders? The Battle Command Sustainment Support System (BCS3) is the battle command system for logistics that helps commanders filter critical logistics information. A CASCOS assessment in 2005 ensured the BCS3 would be the replacement for the Combat Service Support Control System as the core element within the Army Battle Command System (ABCS). The BCS3 provides commanders the core competencies of a logistics common operating picture, logistics reporting, convoy operations, Reception, Staging, Onward Movement, and Integration, and commodity tracking. Although the BCS3 is a highly capable system, there are significant costs in procuring and fielding the system as well as in training. As good stewards of resources, Army leaders must assess if these costs are followed by an adequate return on investment. The initial assessment by CASCOS did not identify all the potential pitfalls of the system and there is evidence that the end users are not accepting and using the system as designed. A new assessment is required and a review of successful implementation of battle command systems may provide insight of how to move forward. The argument concludes with some recommendations for the BCS3 program through describing changes to Doctrine, Organization, Training, Management, Leadership and Education, Personnel, and Facilities (DOTMLPF).					
15. SUBJECT TERMS Logistics, Battle Command, BCS3, ABCS, DOTMLPF, CPOF, TAM, Information technology, Information systems, system use and usefulness					
16. SECURITY CLASSIFICATION OF: (U)			17. LIMITATION OF ABSTRACT (U)	18. NUMBER OF PAGES 48	19a. NAME OF RESPONSIBLE PERSON Stefan J. Banach COL, U.S. Army
a. REPORT (U)	b. ABSTRACT (U)	c. THIS PAGE (U)			19b. PHONE NUMBER (include area code) 913-758-3302

SCHOOL OF ADVANCED MILITARY STUDIES

MONOGRAPH APPROVAL

Major Thomas E. Sachariason

Title of Monograph: The Battle Command Sustainment Support System: The Army's Command and Control System for Logistics

Approved by:

Peter J. Schifferle, Ph.D.

Monograph Director

Thomas S. Hollis, COL, IN

Monograph Reader

Stefan J. Banach, COL, IN

Director,
School of Advanced
Military Studies

Robert F. Baumann, Ph.D.

Director,
Graduate Degree
Programs

Abstract

The Battle Command Sustainment Support System: The Army's Command and Control System for Logistics by Major Thomas E. Sachariason, U.S. Army, 48 pages.

Army commanders on the battlefields in Iraq and Afghanistan lead their forces using a computer-enhanced communications network allowing them to stay connected with dispersed elements and maintain a high level of situation awareness (SA) of their subordinate's operations. However, does the Army have a sufficiently capable computer system for logistics? Is the Army ensuring the system selected provides value added to commanders?

The Battle Command Sustainment Support System (BCS3) is the battle command system for logistics that helps commanders filter critical logistics information. A CASCOM assessment in 2005 ensured the BCS3 would be the replacement for the Combat Service Support Control System as the core element within the Army Battle Command System (ABCS). The BCS3 provides commanders the core competencies of a logistics common operating picture, logistics reporting, convoy operations, Reception, Staging, Onward Movement, and Integration, and commodity tracking.

Although the BCS3 is a highly capable system, there are significant costs in procuring and fielding the system as well as in training. As good stewards of resources, Army leaders must assess if these costs are followed by an adequate return on investment. The initial assessment by CASCOM did not identify all the potential pitfalls of the system and there is evidence that the end users are not accepting and using the system as designed. A new assessment is required and a review of successful implementation of battle command systems may provide insight of how to move forward.

The argument concludes with some recommendations for the BCS3 program through describing what changes to Doctrine, Organization, Training, Management, Leadership and Education, Personnel, and Facilities (DOTMLPF) must occur to gain a reasonable return on investment. The assessment is based on review of the system's core competencies and analysis of video-taped interview results posted on the Sustainment Knowledge Network from Combat Service Support organizations. Two vignettes provide a framework of successful system implementation. Additionally, an interview with BG Edward C. Cardon provides insight on logistics system value to the Brigade Combat Team Commander.

The BCS3 is the optimum solution to provide commanders the ability to command and control their logistics, but the system's shortfalls must be fixed to inspire trust and confidence. Commanders must be convinced of the knowledge management power of the tool to mandate its use. When the BCS3 operation is simplified and users can visualize how it will help them do their job it will gain more user acceptance.

TABLE OF CONTENTS

Introduction	1
Transformation, Battle Command and the Systems	3
Transformation of Army Organizations	5
Battle Command as an Art and Science	7
Battle Command Systems.....	10
<i>ABCS Overview</i>	10
<i>The Battle Command Sustainment Support System</i>	13
Vetting New Systems for Future Requirements	16
The DOTMLPF Process	17
CASCOM's Initial Analysis of the BCS3	18
Analysis Shortfalls.....	19
TRADOC's Vision of Future Combat.....	21
BCS3 is the Optimum Solution	22
Logistics Reporting	23
Convoy Operations.....	25
Reception, Staging, Onward Movement and Integration	26
Commodity Tracking.....	27
Common Operating Picture	27
Investment Costs, Interviews, TAM & Vignettes	29
The Costs in Budget and Man Hours.....	30
Interview Results on Acceptance and Use of the BCS3	32
A Civilian View of a Incorporating New Technology	35
Vignettes of Successful System Implementation	36
Conclusion.....	41
Recommendations	42
Leadership	43
Education.....	44
Training	45
Materiel	47
BIBLIOGRAPHY	49

Introduction

Army commanders on the battlefields in Iraq and Afghanistan lead their forces using a computer-enhanced communications network allowing them to stay connected with dispersed elements while maintaining a high level of situation awareness (SA) of their subordinate's operations. *Joint Publication 1-0: Doctrine for the Armed Forces of the United States* said, "command includes the authority and responsibility for effectively using available resources and for planning the employment of, organizing, directing, coordinating, and controlling military forces for the accomplishment of assigned missions."¹ Regardless of the mission, a significant function involved in such an accomplishment is logistics.

Army Logistics, at its simplest, is about providing healthy, properly supplied and equipped Soldiers at the right place in order to execute their assigned tasks. The military uses the term sustainment to describe the logistical component of command responsibility. Joint doctrine defined sustainment as "the provision of logistics and personnel services necessary to maintain and prolong operations until successful mission completion."² Ensuring Soldiers are in the right location continually with the right equipment requires an artful application of command and sustainment. Effective leadership to accomplish this command and control (C2) of logistics in today's operational environment demands the efficiency of the computer-enhanced communications network mentioned earlier. Ultimately, the computer system the Army provides commanders to "plan, employ, organize, direct, coordinate and control" their forces is critical to mission accomplishment. Therefore, the Army must employ a systemic process to ensure such a command and control system provides the necessary capabilities to accomplish the mission and ensure the organization accepts and uses the system.

¹ US Joint Forces Command (USJFCOM), *Joint Publication (JP) 1-0 - Doctrine for the Armed Forces of the United States* (Washington, DC: Joint Chiefs of Staff, 2007), xv.

² USJFCOM, *JP 4-0 - Joint Logistics*, 2008, vii.

Does the Army have a sufficiently capable computer system for logistics and is the Army effectively employing a systemic process encompassing all the requirements of ensuring the system selected is value added to commanders? The Battle Command Sustainment Support System (BCS3) is the computer system for logistics designed and selected by the Army. Although the system provides necessary tools to command and control logistics, its shortcomings appear to be significantly limiting its return on investment to the force. The level of trust in the system is low because users are not convinced that the system provides the relevant information they need on the logistical status of their organizations. The Army's process for assessing the ease of use and acceptance of the system so that the BCS3 helps users accomplish their assigned tasks, has failed to bring about the kinds of change that would increase the value of the system to commanders. With enhancements in the BCS3 and considerable attention to the process of implementing the system in units at the tactical level, the BCS3 could be of great value to commanders.

In order to affectively address this question, the study discusses Army transformation and then defines and discusses battle command and the Army Battle Command System (ABCS) with special emphasis on the BCS3. The study then describes the vetting process for new programs, reviews a Combined Arms Support Command (CASCOM) analysis of the BCS3 and identifies some future requirements. Next, an argument of why the BCS3 is the optimum solution available is provided. The section provides some analysis through identifying the costs of the BCS3 program, discussing interview results of the system and through review of two vignettes of successful system implementation. The argument concludes with some recommendations for the BCS3 program through describing what changes to Doctrine, Organization, Training, Management, Leadership and Education, Personnel, and Facilities (DOTMLPF) must occur to gain a reasonable return on investment. The research identifies a causal factor for successful implementation of an information or battle command system and proposes a way ahead for the BCS3.

Transformation, Battle Command and the Systems

Throughout history, logistical strength was the backbone of winning wars. The prologue to Napoleon's famous victory at Austerlitz provides an example of logistical prowess in the beginning of modern warfare. In the Fall of 1805, Napoleon moved seven different corps, a 176,000 soldier army, over 400 miles in 34 days from France's western coast, crossing the Rhine River to threaten the Austrian forward element near Ulm.³ Later in the 19th century, railroads played a key role in the U.S. Civil War. Gauge disparities on both sides hindered the use of rail, but Union planners were more able to exploit rail for moving and supplying northern forces due to a more connected rail system.⁴ Later in World War II, the Allies, supported by enormous American industrial strength, moved across oceans to attack the Axis powers in the European and Pacific theaters. Logistics, and its command and control, has been no less important in recent conflicts. A technological revolution, labeled a Revolution in Military Affairs, affected both command and sustainment in the 1990s.⁵ New and improved sea, air and land transport vehicles and changing organization have aided the Army's capability to sustain itself, but a primary catalyst to better expeditionary responsiveness has been vast improvements in computer and communications technology.

In the last forty years, there have been great advances in technology the defense industry has exploited including computer hardware and software, satellite networks, communication

³ Peter Paret, ed., *Makers of Modern Strategy; from Machiavelli to the Nuclear Age* (Princeton: Princeton University Press, 1986), 123.

⁴ Christopher Gabel, *Rails to Oblivion: The Decline of Confederate Railroads in the Civil War* (Fort Leavenworth: Combat Studies Institute, 2002), 13.

⁵ William S. Cohen, "1999 Annual Defense Review," Department of Defense (1999): Chp. 10, "The Revolution in Military Affairs and Joint Vision 2010." A Revolution in Military Affairs (RMA) occurs when a nation's military seizes an opportunity to transform its strategy, military doctrine, training, education, organization, equipment, operations, and tactics to achieve decisive military results in fundamentally new ways.
<http://www.dod.gov/execsec/adr1999/chap10.html#top> (accessed January 23, 2009).

systems and information systems. According to some observers, the U.S. spent the first two thirds of the last century in the industrial age and the remainder adjusting to the ever-expanding force of the information age.⁶ With these advances have come improvements in ground and air weapon systems including the M1A2 Abrams tank and the AH-64 Apache helicopter. They have also provided great improvements in strategic transportation equipment including the C17 Globemaster cargo aircraft and the Fast Sealift Ship. The technological improvements were the impetus for making these different tools bigger, faster, more lethal, more precise, and overall more capable of supporting the needs of the military commander. The improvements in technology can also provide greater capabilities to assist a commander's decision-making process.

As long as there have been wars, the process of commanding and controlling resources has been about leaders making decisions based on the information available to them. Commanders have always relied on information they could sense for themselves or information fed to them through reports in order to make decisions. Once the battlefield was too large and the forces too dispersed for the commander to control alone, the timeliness and accuracy of those reports played an integral role in the decisions the commander chose to make. The Army began making a concerted effort to transform to incorporate the use of and maximize the potential of new technology. This section discusses that transformation, defines battle command and provides an overview of the Army's primary battle command systems.

⁶ David S. Alberts and Richard E. Hayes, *Power to the Edge; Command and Control in the Information Age* (Washington, DC : CCRP Publication Series, 2003), xiv. Moore's Law – The observation that the logic density of silicon integrated circuits has closely followed the curve (bits per square inch) = $2^{(t-1962)}$ where t is time in years; that is, the amount of information storable on a given amount of silicon has roughly doubled every year since the technology was invented. This relation, first uttered in 1964 by semiconductor engineer Gordon Moore (who cofounded Intel 4 years later), held until the late 1970s, at which point the doubling period slowed to 18 months. Pg. xvii

Transformation of Army Organizations

The last several Army Chiefs of Staff led the concept of Army Transformation. The post Cold War transformation of the Army and the thrust through a revolution in military affairs (RMA) began with General Gordon R. Sullivan, Army Chief from 1991 to 1995. General Sullivan envisioned an increase in regional crises and operations other than war and believed technological advances would “drive adjustments in tactics, organization, doctrine, equipment, force mix and methods of command and control.”⁷ General Reimer built on his predecessor’s vision and published Army Vision 2010.⁸ General Shinseki pushed for a more “strategically responsive” Army that was “more responsive, lethal, agile, versatile, survivable and sustainable to meet the needs of the nation.”⁹ General Schoomaker published *The Way Ahead: An Army at War, Relevant and Ready*, discussing his vision to reorganize and transform the Army’s combat and institutional organizations to provide modular, capabilities-based organizations.¹⁰ General Casey’s four imperatives of sustain, prepare, reset and transform stressed balance while continuing the push to transform the Army.¹¹ The chiefs continued the drumbeat of how technology is changing how commanders would fight future battles and they placed great importance on the need for improvements in logistics, “the life blood of armies.”¹²

⁷ Gordon R. Sullivan and James M. Dubik, *Land Warfare in the 21st Century* (Carlisle Barracks, PA: Strategic Studies Institute, 1993), 24-25.

⁸ DA, *Army Vision 2010* (1996), <http://www.army.mil/2010/> (accessed 15 Jan 09).

⁹ Gerry J. Gilmore, *Army to develop future force now, says Shinseki*, Army News Service, Oct 13, 1999, <http://www.fas.org/man/dod-101/army/unit/docs/a19991013shinvis.htm> (accessed 15 Jan 09).

¹⁰ Peter J. Schoomaker, “*The Way Ahead: Our Army at War, Relevant and Ready*,” (Washington, DC: 2004) <http://www.army.mil/thewayahead/relevant.html> (accessed 15 Jan 09).

¹¹ George W. Casey, “*Statement on the Army’s Strategic Imperatives*,” (Washington, DC: 20 07), http://armedservices.house.gov/pdfs/FC092607/Casey_Testimony092607.pdf (accessed 15 Jan 09).

¹² Johnnie W Wilson, John G Coburn and Daniel G Brown, “*Our Revolution in Military Logistics--supporting the 21st century soldier*,” *Army Logistician* 31(Jan/Feb 1999); 3.

Due in part to lessons learned during OIF I, a transformation in logistics paralleled the Army modular transformation from a division-centric to a brigade-centric force.¹³ Army sustainment has moved to a single C2 concept designed to support the warfighter better by streamlining the echelon of logistics C2 and the distribution of supplies. Echelon above brigade support now comes from area support Sustainment Brigades that fall directly under the Theater Sustainment Command or an Expeditionary Sustainment Command if necessary. Brigade Combat Teams (BCT) receive their internal logistics support from their organic Brigade Support Battalions which are now supported by Sustainment Brigades (SB) instead of a combination of Division Support Commands (DISCOM) and Corps Support Groups.¹⁴

The changes in the environment and the distribution process combined with the changes in force structure and doctrine led to new requirements in command and control. Although the initial decisive phase of OIF was mostly a linear fight with the forces moving south to north to secure Baghdad, once the sustainment phase began operations became more asymmetric. Sustainment operations settled into more of a hub and spoke type distribution centered on strategic logistics hubs with robust airfields and road networks. As the primary echelon-above-brigade (EAB) sustainment shifted from DISCOMs to SBs, shared SA became more critical and more complicated. In the COE, SBs normally support multiple BCTs in their area of operations and sometimes BCTs from different divisions. This environment demands a highly capable C2 system.

LTC David M. Moore discussed the relatively recent evolution of command and control systems in his U.S. Army War College strategic research project titled *Battle Command Software:*

¹³ Robert Foley, "OIF Study Group Operational Summary: Information Operations," 15 July 2003, MG Christianson quoted in *On Point I*, "the real problem is that there is no single agent for managing "cargo distribution," whether it is water or a bolt needed on a tank," pg. 149-150

¹⁴ DA, *FMI 3-0.1, The Modular Force* (2008), <http://www.fas.org/irp/doddir/army/fmi3-0-1.pdf> (accessed 22 Jan 09).

Meeting the Commander's Needs? He compares battle command systems used in both Afghanistan and Iraq and how, over time and unit rotations, the conflict's circumstances drove different corps and division-level commands to apply resources into new C2 technology.¹⁵ The logistical commands pursued C2 technological changes as well. In OIF I the 3d COSCOM aligned with V Corps, relied on the JDLM software to maintain situational awareness. The 13th COSCOM aligned under III Corps and subsequently the 1st COSCOM aligned under XVIII Corps sought other emerging systems espoused by their corps headquarters. The new processes and new tools improved logistics SA, but they also required the purchase of stove piped systems, which were not capable of sharing information.

Battle Command as an Art and Science

Battle command is the commander's decision-making process. The U.S. Army has updated its operations doctrine with the latest publication of *FM 3-0 Operations*. In it, the Army defined battle command as "the art and science of understanding, visualizing, describing, directing, leading, and assessing forces to impose the commander's will on a hostile, thinking, and adaptive enemy...apply[ing] leadership to translate decisions into actions—by synchronizing forces and warfighting functions in time, space, and purpose—to accomplish missions."¹⁶ The nature of battle command has changed as the operating environment became larger, more complex and multidimensional.¹⁷ The size and scope of the battlefield forced modern military

¹⁵ David M. Moore, "Battle Command Software: Meeting the Commander's Needs?" (U.S. Army War College, 15 Mar 2006, <http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA449171&Location=U2&doc=GetTRDoc.pdf> (accessed 10 Oct 08).

¹⁶ Headquarters, Department of the Army (DA), *FM 3-0: Operations* (Washington, DC: Department of the Army, 2008), V-5-2.

¹⁷ Richard Sinnreich, "Variables and Constants: How the Battle Command of Tomorrow Will Differ (or Not) from Today's," in *Battle of Cognition: The Future Information-rich Warfare and the Mind of the Commander*, ed. Alexander Kott (Westport, CT: Praeger Security International, 2008), 16.

commanders to decentralize their C2. General Alfred von Schlieffen foresaw the future commander with advanced technology would C2 the battle from the rear.¹⁸

Today's commanders have powerful battle command tools at their disposal capable of quickly providing an immense amount of information, but this requires them to structure what information is most relevant.¹⁹ "More information alone... is no guarantee of effective battle command. Instead, what matters more is the judgment through which that information is filtered and translated into knowledge."²⁰ This cognitive element of battle command is critical; cognition is what supports the decision-making process.²¹ The ability to filter the influx of information becomes even more important during initial offensive operations when forces are generally moving more quickly and the environment is less predictable as battle command progresses. In the Current Operating Environment (COE), most commanders C2 from fixed facilities, but the Army must prepare for the next war. "In the future...the military is planning on a much more mobile command and control, an on-the-move concept that distributes C2 activities and places them in conditions that are intertwined with activities in the battlespace."²² As the environment becomes more complex, the battle command system must adapt to provide the commander the best situational awareness possible.

Battle command and control systems are a combination of computers, networks, databases and software designed to use the power of technology to increase commander's

¹⁸ Ibid.

¹⁹ DA, *FM 3-0*, VII-7-12. *Relevant information* is all information of importance to commanders and staffs in the exercise of command and control. To be relevant, information must be accurate, timely, usable, complete, precise, reliable, and secure.

²⁰ Sinnreich, *Battle of Cognition*, 13.

²¹ DA, *FM 6-0 Mission Command: Command and Control of Army Forces* (2003) III- 3-4.

²² Mica R. Endsley, "Situation Awareness: A Key Cognitive Factor in Effectiveness of Battle Command," in *Battle of Cognition: The Future Information-rich Warfare and the Mind of the Commander*, ed. Alexander Kott (Westport, CT: Praeger Security International, 2008), 103.

situational awareness and thus improve his decisions. There are different systems at different echelons of command. The Global Command and Control System (GCCS) is the military's operational-level battle command system and each service has a tactical component. The Army's tactical component of GCCS is the Army Battle Command System (ABCS).²³ ABCS is a system of core systems (See Figure 1), each designed to provide commanders with tools for specific function. The core system for logistics is the Battle Command Sustainment Support System (BCS3).

The Army has spent many millions to implement the BCS3, but post-deployment interviews from Operation Iraqi Freedom (OIF) and from readiness exercises show negative results regarding the attitudes towards the system. Units are frustrated with the BCS3 and choosing to either not use the system or only use it sparingly, effecting commanders' abilities to plan and command and control (C2) the sustainment of their forces and limiting the benefit the BCS3 provides as a component of ABCS to the Army.

The BCS3 system is complex. The system consists of more than the hardware and software that make up the computer system. The system consisting of strategic leaders who direct the requirements and provide the funding, organizations employing the system's product, networks and supporting systems, supported and supporting corporate programs, essential personnel that monitor, advise, train the operators and provide the equipment, and institutions that educate the operators, future staff officers and commanders. The discussion that follows is on the

²³ ABCS is a combination of the following eleven core systems: Advanced Field Artillery Tactical Data System (AFATDS), Air and Missile Defense Workstation (AMDWS), All Source Analysis System-Light (ASAS-L), Battle Command Sustainment Support System (BCS3), Combat Terrain Information Systems (CTIS), Force XXI Battle Command Brigade and Below (FBCB2), Integrated Meteorological System (IMETS), Integrated System Control (ISYSCON), Global Command and Control System-Army (GCCS-A), Maneuver Control System (MCS), and Tactical Airspace Integration System (TAIS). Program Executive Office Command Control Communications Tactical (PEO-CT3), (Fort Monmouth, NJ: 2009), http://peoc3t.monmouth.army.mil/connecting_systems/ConnectingSystems.html (accessed 21 Feb 09).

broader system. The BCS3 system is complex because of the number and diversity of actors and because of their unpredictable interrelationships and emergent properties.²⁴ To understand the need for improvements in the BCS3 one must understand what drove the development of battle command systems and how they improve commanders' decision-making processes.

Battle Command Systems

The evolution of computer technology has greatly improved communications on the battlefield and made leaps towards improving commanders' situational awareness. The command and control systems used on the modern battlefield use the latest information technology and greatly enhance collaboration between echelons of command. The Army Battle Command System was developed to improve communications on the battlefield. The BCS3 evolved from an earlier version of the logistics element for ABCS and was greatly affected by a commercial off the shelf system. First, this section discusses the ABCS and key core elements within it. Next, the section discusses the Battle Command Sustainment Support System. Because the BCS3 is the focus, the section describes where it came from, how it was developed and what it provides the commander.

ABCS Overview

ABCS is a system of systems (See Figure 1). The ABCS network connects the eleven functional core elements to provide the data for a Common Operating Picture (COP). The ABCS Leaders Reference Guide from 2002 stated, "For military operations in the 21st Century, force projection, split-based operations, information warfare, and joint or combined operations will be the rule. Crucial to these capabilities is the effective flow of information to support warfighting

²⁴ U.S. Army School of Advanced Military Studies, *Art of Design: Student Text*, version 1.0 (Fort Leavenworth, KS: S 2008): 8. See also the discussion of Complexity and Information in

throughout all phases of an operation.”²⁵ *FM 6.0 Mission Command* stated, “Modern information systems (INFOSYS), such as the Army Battle Command System (ABCS), substantially enable mission command. Above all, they allow commanders to provide a COP to subordinates to guide the exercise of subordinates’ initiative.”²⁶

During OIF, different commands used different systems such Command and Control Personal Computer (C2PC) and MCS for their COP, but the system that eventually emerged as the system of choice was the Command Post of the Future (CPOF).²⁷ CPOF is a multi-screen system that allows commanders’ to view digital maps and overlays on one screen while viewing items such as operations orders, instant messages, or other graphics on additional screens. Officially, the CPOF falls under the Maneuver Control System/Tactical Battle Command (MCS/TBC) acquisition program.²⁸ General Dynamics explains the CPOF as “an executive level decision support system providing situational awareness and collaborative tools to support decision making.”²⁹ The CPOF networks with the other ABCS core elements, but it is also dependent on them for detailed information. In essence, it is not a stand-alone system capable of replacing other functional battle command systems. It pulls information from the functional

Harnessing Complexity: Organizational Implications of a Scientific Frontier, Robert Axelrod and Michael D. Cohen (New York: Basic Books, 2000), 25.

²⁵ TPIO-ABCS, Training Division, *ABCS, Army Battle Command System Leader’s Reference Guide*, (Fort Leavenworth, KS: Feb 2002), Ver. 6.2, 1-1.

²⁶ DA, FM 6-0, Mission Command, 1-20-1-21.

²⁷ Kyle Burley, “Linking Strategic Mission Command to Operational Battle Command,” *The Center for Strategic Leadership, USAWC*, Vol. 9, Iss. 4 (JUL/SEP, 2007), The Collins Center Update, [http://www.csl.army.mil/usacsl/Publications/Collins%20Center%20Update%20Vol%209%20Iss%204%20\(Fall%2007\).pdf](http://www.csl.army.mil/usacsl/Publications/Collins%20Center%20Update%20Vol%209%20Iss%204%20(Fall%2007).pdf) (accessed 13 Feb 09).

²⁸ US Department of Defense, “Major Automated Information System Annual Report: Maneuver Control System (MCS)/Tactical Battle Command (TBC),” (Fort Monmouth, NJ: 2007), 3, <https://acc.dau.mil/GetAttachment.aspx?id=198262&pname=file&aid=33360&lang=en-US> (accessed 21 Feb 09).

ABCS elements such as BCS3 and provides collaborative tools that enhance the commander's visualization and communication with subordinates. The ABCS is powerful because it links this network of different core systems and applies certain business rules that require the different systems to use common language and the same interface so the information passes from one to the other and it seamlessly incorporates into the larger COP using a feature called the Publish and Subscribe Server (PASS).³⁰

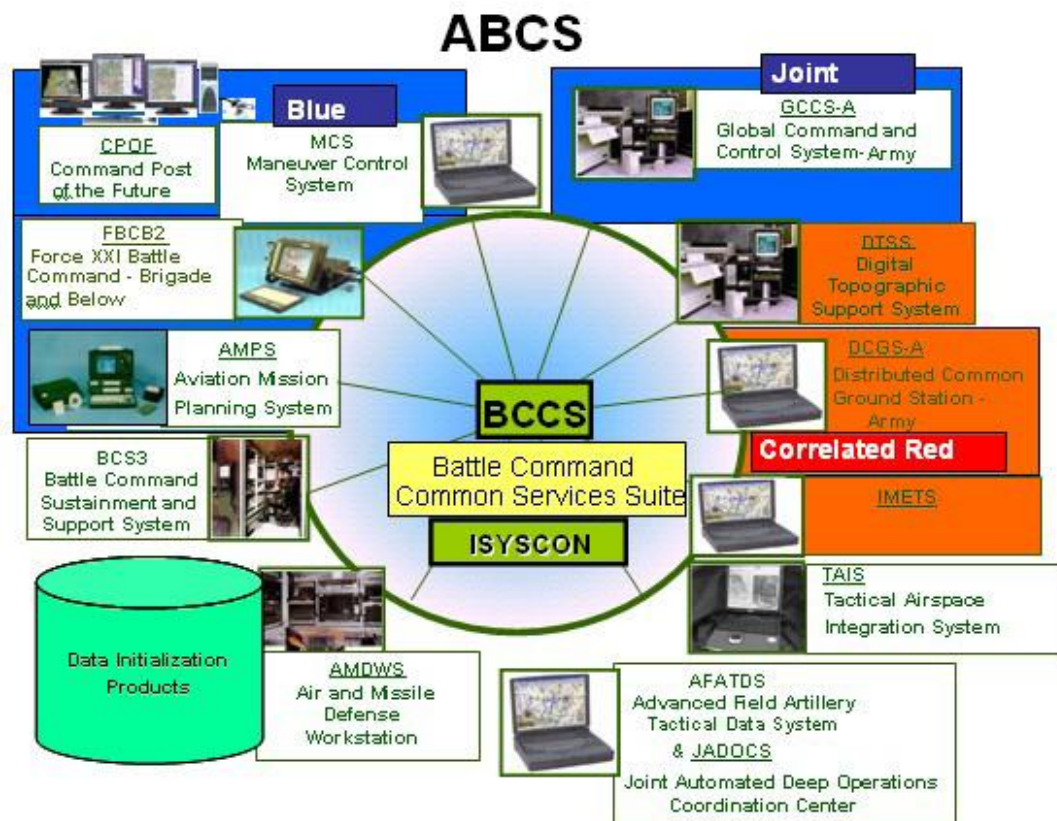


Figure 1: ABCS Core Systems³¹

²⁹ General Dynamics C4 Systems, <http://www.gdc4s.com/content/detail.cfm?item=2a58f8e2-ef2b-4bb1-9251-42ee4961dd7f> (accessed 16 Feb 09).

³⁰ Harold Greene and Robert Mendoza, "Lessons Learned from Developing the ABCS 6.4 Solution," *Defense Acquisition Review Journal* (APR/JUL 2005), 201, <http://www.dau.mil/pubs/arq/2005arq/2005arq-39/Mendoza.pdf> (accessed 10 Jan 09).

³¹ Department of Defense (DoD), Single Interface to the Field (SIF), *Course Introduction and Overview*, <https://sif.kc.us.army.mil/> (accessed 3 Feb 09).

The Battle Command Sustainment Support System

Army Research, Development, Testing and Experimentation (RDT&E) defined the BCS3 on their budget proposal as such:

The Battle Command Sustainment Support System (BCS3) is the logistics Command and Control (C2) solution for U.S. land forces. BCS3 provides commanders the capability to execute end-to-end distribution and deployment management and brings better situational awareness resulting in better decision-making capability to warfighters. It enables warfighters to target, access, scale and tailor critical logistics information in near-real time. BCS3 provides more effective means to gather and integrate asset and in-transit information to manage distribution and deployment missions. BCS3 combines distribution management to include commodity and convoy tracking, and deployment management into a logistics Common Operating Picture (COP) for one mission-focused visual display.³²

Digital command and control systems are relatively new tools for military commanders and especially logistics leaders. In the interim between DS/DS and Operation Iraqi Freedom (OIF), maneuver commanders had C2 systems that helped them see their maneuver units, but needed a system to show them their logistics. The Army developed the Combat Service Support Control System (CSSCS) to accomplish that task. The 1st Cavalry Division tested and used CSSCS with some success in Bosnia in the late 1990s. Shortfalls in the system surrounded problems with task organization changes, latency of data, in-transit visibility problems and issues with shifting data from unclassified systems to classified systems.³³

Prior to OIF I, most logistics units were not equipped with the same network-centric, satellite-based equipment like FBCB2 and Blue Force Tracker that allowed commanders to

³² US Department of the Army, “RDT&E Budget Item Justification (R2 Exhibit),” *Combat Service Support Control System Evaluation and Analysis* (Washington, DC: Feb, 2008), Item number 72, 193, <http://www.asafm.army.mil/budget/fybm/FY09/rforms/vol2.pdf> (accessed 5 Jan 09).

³³ Burt Moore, “CSSCS Gets Thumbs-Up for Peacekeeping in Bosnia,” *The Quartermaster Professional Bulletin* (Spring 1999), http://www.quartermaster.army.mil/oqmg/professional_bulletin/1999/spring1999/CSSCS%20in%20Bosnia.htm (accessed 15 Oct 08).

geographically visualize, gain data and communicate with maneuver elements. Besides elements of the U.S. Army 4th Infantry Division, the logistics units that had operational familiarity with such systems were units in U.S. Army Europe (USAREUR). USAREUR Soldiers used new technology to monitor the movement of M1 tanks from Germany to Kosovo.³⁴ Satellite transceiver tracking devices and Radio Frequency Identification (RFID) devices were used in Europe to track critical train, truck and bus movements as early as 1996³⁵. “In 2003, during the preparation for Operation Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF), CSSCS inadequacies for a fast-moving fluid battlefield became apparent. The system was not used at all during the initial phase of OIF.³⁶ At the August 2003 Program Review Board, CSSCS development was terminated.”³⁷

CSSCS had some initial successes, but the pre-OIF failures in field tests created a vacuum that energized a need for a different system to fill the void. Tapestry Industries of San Diego, CA developed the Joint Deployment Logistics Model (JDLM) for Army simulation exercises, but the software was developed and tested to provide commanders “real world” or operational logistics information. The JDLM got its first real test during V Corps’ Victory Strike III exercise in Poland in September and October of 2002. As described in *On Point I* “In September 2002, V Corps and selected subordinate command posts deployed to Poland and

³⁴ Earl Kennedy, “*Forging an Alliance: Army Transporters in Europe*,” *Army Logistician* (Sep/Oct 2000), <http://www.almc.army.mil/alog/issues/SepOct00/MS603.htm> (accessed 7 Jan 09).

³⁵ DA, *FM 3-0, Operations* (2001) “*Leveraging Technology--Real-Time CSS*,” Chp. 12, “CSS,” <http://www.globalsecurity.org/military/library/policy/army/fm/3-0/ch12.htm> (accessed 5 Jan 09).

³⁶ Eric Shirley, “*Army Battlefield Distribution Through the Lens of OIF: Logical Failures and the Way Ahead*,” CGSC, SAMS (AY 04-05), <http://cgsc.cdmhost.com/cgi-bin/showfile.exe?CISOROOT=/p4013coll3&CISOPTR=370&filename=371.pdf#search=%22JDLM%22> (accessed 7 Dec 08).

³⁷ United States Army Combined Arms Support Command (CASCOM) Director of Enterprise Systems, *DOTMLPF Assessment of BCS3* (OCT, 2005),

conducted Exercise *VICTORY STRIKE*... V Corps also used this exercise to test its deployment systems, as it deployed a large portion of the corps to Poland and back again.”³⁸

The 3d Corps Support Command, along with V Corps headquarters, used the JDLM software to track the deployment of V Corps units from their kasernes in Germany to the Drasko Pomorski Training Area (DPTA) in Poland. During the exercise, the commanders wanted to train and prepare their units, but also exercise a “proof of concept” for how commercial off the shelf (COTS) technology could be used to assist in planning and managing unit movements, supply and maintenance status and distribution of sustainment supplies. The JDLM software, operated by Soldiers and staff officers, was able to display the movement of unit equipment, supplies and personnel moving on trains, trucks and buses, and all arrayed against a digital map so that it was similar to maneuver systems such as C2PC and MCS, which maneuver commanders were already familiar.³⁹ The operational test of the JDLM was successful, but it did mean that there would be another computer system to add to the growing number of COTS systems in Army headquarters.

BCS3 evolved due to a need for commanders to have a C2 system that could help them gain situational awareness on their unit’s logistical status. As mentioned, Army commanders used other systems to obtain SA on maneuver elements, but needed more information on logistical capabilities and requirements within their commands. Early in OIF, the COP provided situational awareness using two primary systems, C2PC for the maneuver forces and JDLM for logistics

<https://www.cascom.lee.army.mil/private/esd/bcs3/index.asp?dir=DATA\DOTMLPF> (accessed 7 Dec 08).

³⁸ Gregory Fontenot, E.J. Degen, and David Tohn, *On Point: The United States Army in Operation Iraqi Freedom* (Fort Leavenworth, KS: Combat Studies Institute Press, 2004), 53.

³⁹ Author’s personal experience as the primary JDLM operator for the CG, 3d COSCOM during the U.S. Army V Corps Victory Strike III exercise in Poland, Sep/Oct 2002.

convoys.⁴⁰ The two systems were stovepiped, COTS products operating on different networks. C2PC operated on the classified network and JDLM was on the unclassified network only.

Because the primary tracking systems were on different networks, the systems could not share information and therefore the headquarters had an operations COP and a separate, Logistics COP (LCOP). Issues such as these drove the Chief of Staff of the Army in 2003 to state that the Army would now “shift its funding efforts from developing the Battle Command architecture from the bottom-up to one that is focused on developing the architecture from the top-down.”⁴¹ The combination of the “top down” focus, the failures of the CSSCS and the JDLM’s relative success led to a 2004 decision for JDLM to become the heart of the new system called the BCS3.⁴² Although the JDLM did show promise in OIF I, how did the Army reach the decision to build the new BCS3 using JDLM as its centerpiece?

Vetting New Systems for Future Requirements

When Congress passed the Goldwater-Nichols Department of Defense Reorganization Act of 1986, it became law that the Chairman of the Joint Chiefs of Staff (CJCS) and Vice Chairman of the Joint Chiefs of Staff (VCJCS) would work to create a military more Joint in nature; a military force capable of conducting effective joint operations. In order to achieve “jointness,” the services required new and different capabilities. This section examines the process of vetting those requirements and the DOTMLPF, describes how individuals from the

⁴⁰ Dave Cammons, John Tisserand, Duane Williams, Alan Seise and Dough Lindsay, “Network Centric Warfare Case Study: U.S. V Corps and 3rd Infantry Division (Mechanized) During Operations Iraqi Freedom Combat Operations (MAR/APR 2003),” (Carlisle Barracks, PA: Center for Strategic Leadership, 2006), 37, <http://www.carlisle.army.mil/usacsl/Publications/NCWCSVol1.pdf> (accessed 15 Dec 08).

⁴¹ Greene and Mendoza, “Lessons Learned from Developing the ABCS 6.4 Solution,” *Defense Acquisition Review Journal* (APR/JUL 2005), 201, <http://www.dau.mil/pubs/arq/2005arq/2005arq-39/Mendoza.pdf> (accessed January 10, 2009).

CASCOM applied the DOTMLPF process to the BCS3, identifies some apparent shortfalls and discusses future conditions that should influence current leaders to adapt their C2 processes and change organizational training.

The DOTMLPF Process

As part of Goldwater-Nichols, the VCJCS heads the Joint Requirements Oversight Council (JROC). The JROC consists of senior military leaders and advises the CJCS on requirements programs and budget priorities.⁴³ To achieve the National Security Strategy and ensure that service organizations have what they need, the Department of Defense (DoD) employs three principal decision-making support systems. The systems are the Planning, Programming, Budgeting and Execution (PPBE) process, the Joint Capabilities Integration and Development System (JCIDS) and the Defense Acquisition System.⁴⁴ “The JCIDS process was created to support the statutory requirements of the JROC to validate and prioritize joint warfighting requirements.”⁴⁵ The requirements are typically new systems or capabilities that fill a service shortfall. In order to align with policy and meet minimum requirements, identified capabilities are assessed against the spectrum of DOTMLPF.

⁴² Brian Swan, “USAREUR: On Point for Logistics Technology Transformation,” *Army Logistician* (MAR-APR 2006) 34, http://www.almc.army.mil/alog/issues/MarApr06/pdf/mar_apr_06.pdf (accessed 15 Oct 08).

⁴³ Chairman Joint Chiefs of Staff Instruction (CJCSI) 3180.01, “Joint Requirements Oversight Council (JROC): Programmatic Processes for Joint Experimentation and Joint Resource Change Recommendations,” (Washington, DC: 2002), http://www.dtic.mil/cjcs_directives/cdata/unlimit/3180_01.pdf (accessed 12 Feb 09).

⁴⁴ U.S. Department of Defense, “Integration of the DoD Decision Support System,” *Defense Acquisition Guidebook*, (Washington, DC: 2004), 1.1, <https://akss.dau.mil/dag/DoD5000.asp?view=document> (accessed 12 Feb 09).

⁴⁵ CJCSI 3170.01F, “Joint Capabilities Integration and Development System,” (2007), http://www.dtic.mil/cjcs_directives/cdata/unlimit/3170_01.pdf (accessed 12 Feb 09).

The combined results of a Functional Area Analysis (FAA), Functional Needs Analysis (FNA) and Functional Solutions Analysis (FSA) make up the total JCIDS analysis, but completed at different times. An FAA begins the process and identifies an operational task, condition and standard for a specific military objective. The FNA assesses the ability of current and programmed capabilities to accomplish the task. The FSA includes the DOTMLPF assessment used to determine if an identified solution adequately fills the capability gap.⁴⁶ What exactly is the DOTMLPF assessment?

The DOTMLPF assessment is investigating the problem against each area to gain more specificity on the nature of the problem. It is “a problem-solving construct for assessing current capabilities and managing change.”⁴⁷ Different agencies, such as Joint and Service experimentation, Senior Warfighter Forums, battle laboratories and combatant commanders, complete assessments and submit change recommendations. One should not confuse this process with the exigent requirements identified by organizations preparing to deploy or already involved in combat operations. The processing and funding are different for urgent operational needs and they are called Operational Needs Statements (ONS), Joint Urgent Operational Need (JUON) or Immediate Warfighter Needs (IWN), based on the service and urgency of the need.⁴⁸

CASCOM's Initial Analysis of the BCS3

The Directorate of Enterprise Systems within CASCOM conducted an assessment on the BCS3 in 2005.⁴⁹ The assessment provided a background of the BCS3 and then described the

⁴⁶ COL Hugo Keyner, “*Joint Capabilities Integration and Development System (JCIDS): Moving to a Capabilities-based Process*,” PEO/SYSCOM Conference, 3 Dec 2003, Joint Staff, J8. [https://ucstcdom03.ahf.nmci.navy.mil/n6/a_webdoc01.nsf/3D0309DCAA2645FA852571F4007607F8/\\$File/JCIDS%20PEO%20SYSCOM%20Brief.pdf](https://ucstcdom03.ahf.nmci.navy.mil/n6/a_webdoc01.nsf/3D0309DCAA2645FA852571F4007607F8/$File/JCIDS%20PEO%20SYSCOM%20Brief.pdf) (accessed 4 Feb 09).

⁴⁷ DA, *FM 1, The Army* (2005), 4-4.

⁴⁸ CJCSI 3170.01F, A-1.

⁴⁹ USACASCOM, “DOTMLPF Assessment of BCS3.”

system in more detail. In the system description, it stated that Army Task (ART) 7.0, Command and Control (C2) is the primary Battlefield Operating System (BOS) and mission area for the BCS3 and that it directly contributes to the performance and success of the Combat Service Support (CSS) BOS (ART 6.0).⁵⁰ Next, the assessment provided feedback on each of the DOTMLPF areas.

The directorate used a Green, Amber, Red rating scale with “G” meaning little to no impact, “A” meaning some impact or the system could cause expenditure of some resources, and “R” meaning high impact or that there may be significant changes to this area. The results were mostly positive regarding the BCS3’s impact across the DOTMLPF. Personnel and Facilities received a rating of Green, Doctrine, Organization and Materiel received Amber, and Training and Leadership rated Red. The assessment raised issues in terms of updating antiquated Field Manuals and states that “the system does have significant training requirements.” It also listed training as an issue in the leadership area. More specifically, the report stated, “Additional leader training is required to accelerate the level of leadership acceptance of the system.”⁵¹

Analysis Shortfalls

The CASCOT team fully described the background of the BCS3 in the 2005 study and how the new system replaced CSSCS as the core CSS system within the ABCS. The analysis discussed CSSCS’s failure to achieve operational requirements and how the BCS3 incorporated the Logistics Common Operating Picture (LCOP) provided by JDLM. The significant shortfalls in the assessment are that the directorate failed to acknowledge what caused CSSCS to fail or any shortcomings of JDLM in order to compare and contrast them with the improvements in the

⁵⁰ Battlefield Operating Systems have been replaced in Army doctrine by Warfighting Functions. The Combat Service Support BOS is now called the Sustainment WFF. See Chapter 4, *FM 3-0: Operations*, 4-5.

⁵¹ Ibid.

BCS3. Surprisingly absent were any short falls regarding the use of the system in a garrison or training environment or the capability shortfalls in combat operations. The assessment mentions that the BCS3 operates on both the unclassified and classified networks, but failed to explain the required air gap, “swivel-chair” procedures that lead to an unacceptable latency of data.⁵² Not surprisingly, issues raised in the post deployment interviews regarding the BCS3 demonstrate a consistent theme of results in the evolution of the core CSS system.⁵³

In the 1st Cavalry Division’s CSSCS operational test in Bosnia in 1998 the staff identified several weaknesses in the system to include: latency of data, problems with low side and high side, etc.⁵⁴ In 2008, post deployment interviews report nearly identical issues. The CASCOM directorate wisely recognized leadership was a key concern and advised it would take extensive leader training to gain acceptance of the system. Interview feedback indicates very few units use the system so either CASCOM’s identification of the problem failed to influence further training development for leaders or some other problem caused the lack of acceptance. The combination of the lack of a thorough assessment in late 2005 and the poor acceptance rates through the end of 2008 indicate a need for another assessment.

⁵² The logistics STAMIS data and location updates for trucks equipped with Movement Tracking System satellite transceivers is resident on unclassified computer servers. Current security policies require a manual transfer of this data to allow for an “air gap” between the unclassified and classified systems. The “swivel-chair” process can take hours and may negate the timely benefit of the information. See the TCM PCC Brief at <https://www.cascom.army.mil/private/esd/BCS%20briefings%20page/Index.asp> The technology to complete this process through a secure means is available (Data Sync Guard, <http://www.tridsys.com/white-collgate.htm>), but remains unauthorized for all the data that flows through BCS3.

⁵³ CASCOM, “CSS Pre-Command Course,” (Jul, 2008), Slide number 13, <https://www.cascom.army.mil/private/esd/BCS%20briefings%20page/Index.asp> (accessed 20 Feb 2009).

⁵⁴ Burt Moore, “CSSCS Gets Thumbs-Up for Peacekeeping in Bosnia,” 2.

TRADOC's Vision of Future Combat

The U.S. Army Training and Doctrine Command (TRADOC) has published a series of pamphlets regarding future combat from 2015-2024. TRADOC said that future technology and leaders must compress the planning, execution and assessment process.⁵⁵ TRADOC went on to say, “The network will provide the means for forces at all levels to: achieve situational understanding; establish, maintain, and distribute a COP; create the commander-centric C2 environment and operate within a noncontiguous battlefield framework.”⁵⁶ Although the ABCS is prevalent throughout the force, many commanders still rely on reports on power point slides and other static information provided by their staffs to gain SA. The Training and Doctrine Command (TRADOC) sees the future of battle command requiring commanders to take more advantage of technology to gain situational awareness (SA).⁵⁷ These statements lead one to see that first, the funded and approved systems need to provide the capabilities commanders need on the battlefield and secondly, the culture needs to adapt to the technology.⁵⁸ Commanders must demand change and staffs must incorporate the powerful tools embedded in the latest technology instead of relying on old processes.

The interview results, later in the study, reveal commanders and logistics officers within Brigade Combat Teams and Sustainment Brigades chose not to use the BCS3 because it could not provide the relevant information they needed in a timely manner. The CASCOM TRADOC

⁵⁵ DA, TRADOC Pamphlet 525-3-0, “The Army in Joint Operations: The Army’s Future Force Capstone Concept 2015-2024,” (Fort Monroe, VA: U.S. Army Training and Doctrine Command, 2008), Ver. 2, 35.

⁵⁶ Ibid, 37.

⁵⁷ DA, TRADOC Pamphlet 525-3-3, The U.S. Army Functional Concept for Battle Command 2015-2024 (Fort Monroe, VA: 2007), Ver. 1.

⁵⁸ Gene Rochlin, *Trapped in the Net: The Unanticipated Consequences of Computerization* (Princeton: Princeton University Press, 1997), VIII, para. 27, <http://press.princeton.edu/books/rochlin/> (accessed 18 Feb 09).

Capabilities Manager (TCM) recognized some of the same shortfalls indicated in the interview videos and published proposed changes to the BCS3 software. In a FY09-10 Functional Requirements Document, the TCM described intent to “get significantly more capable, easier to use, software into the hands of the user...”⁵⁹ The document acknowledged feedback from the field regarding data inconsistencies, problems with startup procedures, intuitive issues and training shortfalls. The TCM also recognized communication problems BCS3 has had within the ABCS and proposed changes to alleviate future issues. Additionally, changes to improve the combat power report to include CL IIIB – petroleum, CL V- ammunition, CL VII-major end items and Personnel should make the BCS3 of more use to the tactical commander.

BCS3 is the Optimum Solution

Although enhancements are necessary to improve the overall performance, the BCS3 is currently the most capable computer system to battle command logistics. It is the only system that operates on both the classified and unclassified networks, the only one poised to provide enhanced capabilities in the future and the only system currently capable of providing commanders the core competencies (See Figure 2) of a logistics COP, logistics reporting, convoy operations, Reception, Staging, Onward Movement and Integration (RSO&I) support, and commodity tracking. The BCS3 has the flexibility to display a wide range of information to commanders’ from the strategic to the tactical level and all on a graphic display the operator can modify to meet the commander’s specific requirements. The effectiveness of these core competencies and their ability to provide the commander the relevant information he or she needs can be the single point of failure to developing trust in the system. This section describes the different core competencies and how they contribute to making the BCS3 the optimum solution for logistics C2 on the battlefield.

⁵⁹ CASCOM, “FY09-10 Functional Requirements Document (BCS3),” Fort Belvoir, VA.: March

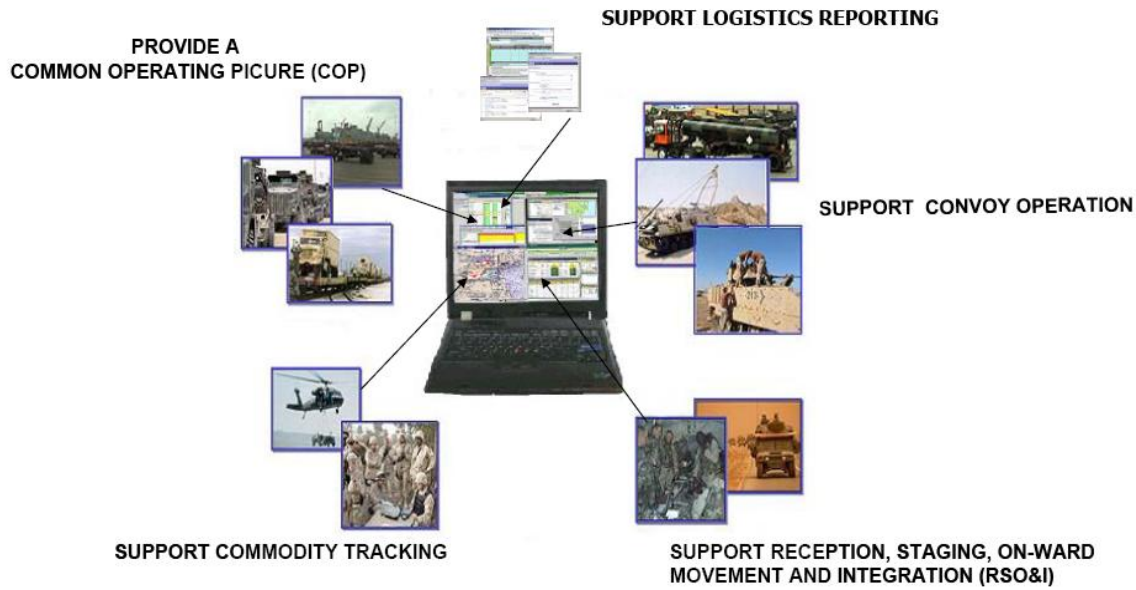


Figure 2: BCS3 Core Competencies⁶⁰

Logistics Reporting

Commanders receive logistics reports through the BCS3 in a couple different ways. Reports are generated by accessing automated logistics information from national sources such as the LOGSA or ITV servers (see Figure 3) and by compiling reports manually uploaded by units within their task organization. The BCS3 accesses and integrates data from the Standard Army Management Information Systems (STAMIS) such as the Standard Army Maintenance System – Enhanced (SAMS E), Standard Army Ammunition System SAAS, and the Standard Army Retail Supply System (SARSS) through communication between the STAMIS and the BCS3 computer networks.⁶¹ This sharing of information provides staff officers and system operators the ability to quickly research and show commanders critical information.

17, 2008, <https://www.us.army.mil/suite/doc/12480934> (accessed January 10, 2009).

⁶⁰ DoD, SIF, *Course Introduction and Overview*.

⁶¹ GCCS-A briefing, CASCOM https://www.cascom.lee.army.mil/private/esd/GCSS-A/Briefing/GCSS-Army_Overview9April2007.ppt

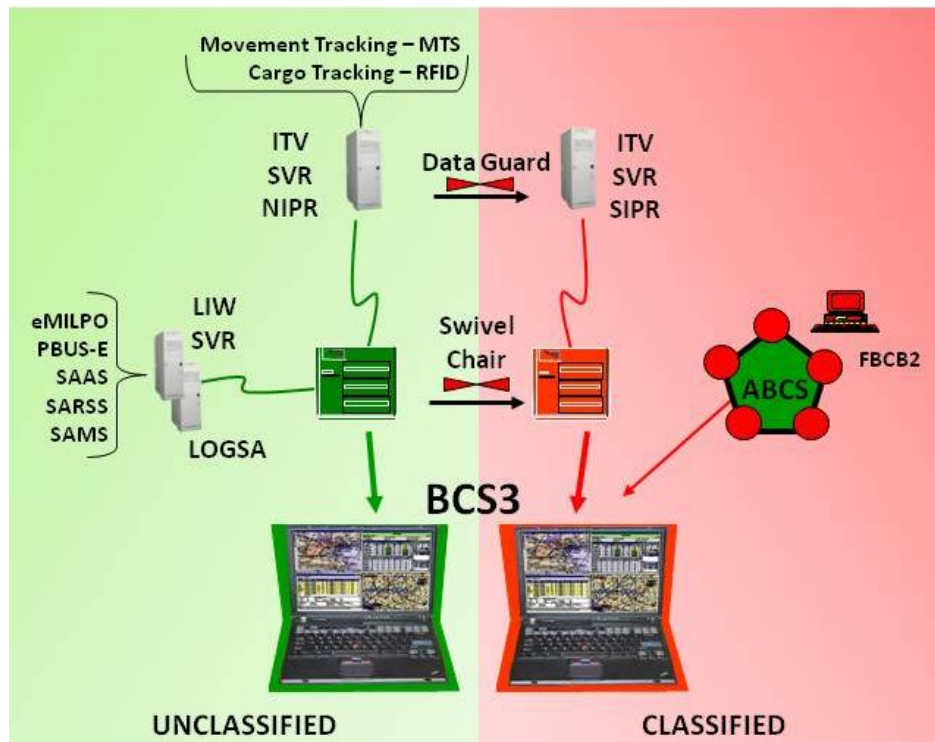


Figure 3: System Inputs and Different Networks⁶²

A major shortfall in current Army logistics reporting is that not all classes of supply have an automated management system. For instance, commodities such as Class (CL) I, rations and water and CL III (bulk petroleum) are not tracked through a standard Army system. Part of the reason is that these commodities are generally pushed to organizations based on their headcounts and or equipment lists using basic consumption factors versus pulled by units through automated requests. Regardless, until the Army develops and integrates sensors for these commodities it will require manual reports for proper management. Therefore, the BCS3 uses a manual process in order to receive critical reports on unit's status of these supplies. The current solution is a logistics status (LOGSTAT) report called the "Logistics Reporting Tool (LRT)" where the BCS3 operators input the LOGSTAT data manually via the LRT application or upload an Excel

⁶² Ibid, adapted from slide number 17.

spreadsheet.⁶³ The LRT provides the required SA commanders need to ensure critical classes of supply are on hand and it saves higher-level commander's time because it integrates all of the unit's information on one screen versus wasting time contacting individual subordinate commanders for their status.

Convoy Operations

The capability to battle track convoys in the combat zone is another key contribution of the BCS3. The BCS3 is unique in this regard because it is the only system within the ABCS that operates on both the unclassified and the classified networks providing commanders the ability to see civilian contracted convoys equipped with commercial satellite tracking devices as LTC Stewart discussed in a recent Army Logistician article.⁶⁴ Without the BCS3, BCT tactical operating centers would not have visibility on the civilian convoys moving through their area of operations. Army convoys are primarily equipped with the Movement Tracking System (MTS) allowing commanders to monitor the movement and the communication of convoy commanders and their headquarters. Text messages sent from the mobile MTS-equipped vehicles are visible through the BCS3 COP providing rapid transfer of information.

The BCS3 also provides a unique capability for tracking the progress of convoys. Operators of the BCS3 can set alarms called proximity reports that signify when a convoy has reached a critical threshold such as a certain distance from its destination. These reports may require decisions or communication requirements and may serve to prompt commanders to execute some action. For example, a convoy may include trucks carrying high priority repair parts. The commander may direct special emphasis on expediting that particular truck through

⁶³DoD, SIF, *BCS3 LRT Introduction*, <https://www.kc.us.army.mil/sifhome.nsf/usfsrchomenew?OpenFrameset&cats=BCS3>

⁶⁴ LTC S. Eric Stewart, "BCS3: *Getting the Most Out of a Strategic Sustainment Tool*," *Army Logistician*, Sep-Oct 2008, http://www.almc.army.mil/alog/issues/SepOct08/bcs3_stategic.html

security checks and to the distribution center. The proximity report cues operations personnel the convoy is approaching the perimeter and can quickly notify required personnel to prepare for its arrival. Another example could be setting a proximity report for high-density incident locations. There are several locations on the main supply routes in Iraq that routinely experience activity of enemy improvised explosive devices. Commanders may want to pay special attention when convoys are entering or nearing these locations and the visual cues of the proximity reports quickly capture the attention of the BCS3 operators as they flash on the screen.

Reception, Staging, Onward Movement and Integration

Critical to any expeditionary operation is closely monitoring the Reception, Staging, Onward Movement and Integration (RSO&I) of the forces involved.⁶⁵ “In the early stages of planning, there are periods of time— critical windows of opportunity—where commanders make irrevocable decisions concerning deploying units in a time phased sequence.”⁶⁶ The BCS3 provides planning tools to forecast the RSO&I process to enable planners to visualize potential hazards such as congestion at sea or air ports and overall force flow into a theater of operations. Once a force deployment list is finalized and units begin movement, the BCS3 provides the capability for commanders to monitor both their equipment and personnel through the process. As equipment and personnel are manifested on strategic lift assets such as aircraft and cargo ships and those manifests are electronically uploaded into computer databases such as the Global Transportation Network (GTN), the BCS3 can track those shipments projecting and confirming

⁶⁵ Joint Doctrine (JP 1-02) defines RSOI as “A phase of joint force projection occurring in the operational area. This phase comprises the essential processes required to transition arriving personnel, equipment, and materiel into forces capable of meeting operational requirements.”

⁶⁶ DA, *FM 100-17-3: Reception, Staging, Onward Movement and Integration* (Washington, D.C.: 1999), vi.

arrival at their destinations. These powerful tools allow commanders to visualize force flow of their organizations and project levels of combat power over time.

Commodity Tracking

In addition to the satellite tracking devices mentioned earlier, another critical capability of the BCS3 is its ability to track Radio Frequency Identification (RFID) devices. RFID technology provides commodity tracking for commanders by attaching RFID tags to supplies required for shipment through the transportation network. Each individual tag has a specific number often referred to as a “license plate” and that number or code relates to specific stored information about the supplies such as the category and quantity of supply, document numbers, the origin and destination for that specific item. All of the detailed data is stored on in-transit visibility (ITV) databases. A network of RFID sensors called interrogators exist at key nodes along routes such as major intersections, supply depots, sea and air port entrance and exit and distribution centers in the theater of operations. When the RF tags pass by the interrogators, the interrogator identifies the tag by its license plate number and sends information to the ITV network updating the database on the location of the supplies as they move. The BCS3 has access to these databases and therefore can track movements of any tagged equipment or supplies.

Common Operating Picture

The BCS3 provides operators the capability to create different operational views (OPVIEWS). “OPVIEWS in the BCS3 are graphic displays of tactical operations similar to earlier versions that were displayed using multiple layers of acetate over a paper map. The BCS3 OPVIEWS are electronic “layers” of information on a digital map.”⁶⁷ OPVIEWS provide detailed

⁶⁷ Thomas Sachariason, “*Why BCS3 “Doesn’t Work”*”, *Army Logistician* (Nov/Dec 2007), http://www.almc.army.mil/ALOG/issues/NovDec07/bcs3_doesnt_work.html (accessed 20 Sep 08).

information in a graphical format in order to communicate a lot of information in short amount of time. For example, if a commander wanted to see the status of all his or her convoys simultaneously, the BCS3 operator would construct an OPVIEW only showing the transporter icons of that particular unit. The operator could make the color of each convoy different to sort out different subordinate units or to designate certain high priority supplies.

Another feature within the BCS3 is automated reports that include items such as maintenance status of critical equipment, fuel and ammunition levels or updates on personnel. The report is a graphic depiction because it lists the critical items and provides a Green, Amber, Red and Black color code representing various levels of status of each particular item or area of concern. The color-coded data can quickly capture the commander's attention and lead him or her to ask for more information on specific issues or to make quick, informed decisions. The staff can build the commander's key logistical Critical Information Requirements into the operational views to add relevancy and focus during battle update briefings.⁶⁸

These tools add to the commander's visualization and overall battle command process through increased situational awareness and by enabling subordinate commanders and staffs to stay current on the commander's intent and mission orders.⁶⁹ All of these add extraordinary capabilities, but the benefits of such a battle command system are only realized when the system provides what it promises under the stress of full spectrum operations and units find it valuable for their operations. So far, based on interviews with commanders such as Colonel Mark Barbosa of the 7th Sustainment Brigade, the BCS3 has not gained universal acceptance throughout the

⁶⁸ DA, FM 3-0, Operations, V- 5-8.

⁶⁹ Ibid, V-5-5.

Army.⁷⁰ Interview results shown later in the study, demonstrate Army organizations may or may not be training with the BCS3, but few are using the system when deployed.

Investment Costs, Interviews, TAM & Vignettes

As previously stated, the Army has spent many millions on the development and procurement of the BCS3. The costs are substantial and must be weighed against the benefit to the organization. The Dupont Company was one of the first civilian corporations in the 20th century to use management accounting systems.⁷¹ Within the accounting systems, Dupont developed the performance measure called the Return on Investment (ROI) and it equaled the operating income divided by the investment.⁷² Since the Army is a government agency and not designed to create a profit, measuring a ROI for a military material asset or system is different. The basis of the return cannot be on future sales or savings, but on benefits such as increased decision-making, improved situational awareness, and improved capabilities for planning future operations. Nevertheless, how does one effectively measure any of those benefits? The only way to truly measure if the system will provide a ROI to the Army is for Army units to actually use the system in the manner that it is designed and subsequently provide feedback on its worth. This section describes the funding costs to the Army and other expended resources. Next, the section discusses some operational results in the form of feedback from Army unit interviews post deployment from OIF or OEF as well as some feedback following major training exercises. Finally, it describes two case studies of successful system employment.

⁷⁰ Tony Skubi, “*Commander Interview, COL Mark Barbosa,*” Sustainment Knowledge Network, Battle Command Knowledge System, <https://forums.bcks.army.mil/secure/CommunityBrowser.aspx?id=720448&lang=en-US> (accessed 5 Feb 09).

⁷¹ Anthony Atkinson, Rajiv Banker, Robert Kaplan and S. Mark Young, *Management Accounting*, 2d ed. (New Jersey: Prentice-Hall, Inc. 2007), 13.

⁷² Atkinson, Banker, Kaplan and Young , 14.

The Costs in Budget and Man Hours

The funding costs for the BCS3 are bifurcated between the Department of the Army Procurement program and Research, Development, Testing and Evaluation (RDT&E), but those are only the Army level budget monies allocated to the system and do not represent all the real costs to the Army and its subordinate organizations. There are significant costs to Army units as well. This section describes these costs by listing the budget amounts over the past few years and briefly outlining the resources expended by Army organizations.

The Army categorizes the BCS3 as a “Tactical C2 System” on its procurement budget and lists it under “Advanced Component Development and Prototypes” for the RDT&E justification documents⁷³. The table below shows these prospective budgets for fiscal years 2007-2009:

Budget	FY 2007	FY 2008	FY 2009
Procurement	*33,107	32,935	29,987
RDT&E	8,403	14,959	17,788

*Actual requirement

Table 1: BCS3 Budget Estimates (in millions)

The costs in Table 1 are just a small sample of the funding applied to the development of the BCS3. There were millions more applied to research and development prior to 2007.⁷⁴

Additionally, the Army funded the research and development of the CSSCS for several years

⁷³ US Department of the Army Procurement Programs, “*Tactical C2 Systems, BCS3*,” (Feb, 2007), Item #99, 232, <http://d.scribd.com/docs/1nd8saqhbxyh3eblgk2q.pdf> ; US Department of the Army, *RDT&E Budget Item Justification (R2 Exhibit), Combat Service Support Control System Evaluation and Analysis* (Feb, 2008), Item # 72, 193, <http://www.asafm.army.mil/budget/fybm/FY09/rforms/vol2.pdf> (accessed 27 Jan 09).

⁷⁴ RDT&E Budget Item Justification (R-2 Exhibit) estimated an average of nearly \$8 million per year for CSSCS from FY 2002 through FY 2006, <http://www.dtic.mil/descriptivesum/Y2004/Army/0603805A.pdf>

prior to that and USAREUR funded the licensing, testing and development of JDLM prior to OIF.⁷⁵

Beyond the monetary costs, Army organizations also expend resources. When the BCS3 became the core logistics system for ABCS, the Army developed and began implementing the basis of issue plan (BOIP) to include a New Equipment Training (NET) program. The BCS3 is a part of the Army's Modernization Strategy and its NET follows the Army's modernization process as described in Chapter 5, Army Regulation 350-1.⁷⁶ The fielding is also a part of the "Reset and Train" portion of the Army Forces Generation (ARFORGEN) process; therefore, every brigade and higher-level organization scheduled for deployment was automatically scheduled for fielding of the BCS3 equipment and for the NET.⁷⁷ The impact, especially to a deploying organization, is substantial. First, the equipment fielding consists of receiving the multiple sets of computer hardware and requires the time and expertise of the property book officer, unit leaders and supply personnel. Second, the NET is even more resource intensive.

There are typically different levels of training for senior leaders, supervisors and operators and specific administrative training for communications specialists and maintainers. The senior leaders and supervisors receive an overview of the system and the operators routinely go through a standard 40-hour block of instruction (roughly one week). The typical BCT receives 10 BCS3 systems and SBs nearly twice that many systems, distributing them in the S3, S4 and either Brigade Support Battalion, in the case of the BCT, or in the Support Operations section in

⁷⁵ Brian Swan, USAREUR, 34.

⁷⁶ DA, "Additional Modernization Initiatives in Focused Logistics," *Army Modernization Strategy 2008* (Washington, DC: 2008), Annex A, Appendix 13, <http://www.army.mil/institution/leaders/modplan/> (accessed 15 Feb 09).

⁷⁷ DA, *Posture Statement, Addendum E: Army Forces Generation (ARFORGEN) Process*, 2008, http://www.army.mil/aps/08/addenda/addenda_e.html (accessed January 15, 2009).

the Sustainment Brigade.⁷⁸ This distribution creates the requirement to train the leadership and an adequate number of personnel as operators. Therefore, the impact to each unit is factored by the number of systems multiplied by the number of training hours. The result is hundreds of training hours per organization (over 400 in each BCT) within an ARFORGEN process that does not have a lot of flexibility built into the timeline.

The current budget environment and high operational tempo demand leaders closely scrutinize resource expenditures whether in budget dollars or Soldier training time. At the Army level, the tens of millions spent and the thousands of mandatory training hours conducted warrants an assessment of whether the Army benefits from the system in its current configuration or not. Additionally, if the assessment indicates significant shortfalls then it must determine the primary causes of those shortfalls and recommend solutions. Short of a comprehensive study and analysis, what information and results are available to leaders indicating a need for another look at the usefulness and acceptance of the BCS3?

Interview Results on Acceptance and Use of the BCS3

As discussed, the BCS3 is a significant investment for the Army and so the Army must assess if that investment is sound. The pie chart at Figure 4 shows the results of videotaped interviews posted on the Sustainment Knowledge Network (SKN).⁷⁹ The Combined Arms Support Command (CASCOM) Center for Lessons Learned Combat Leader Interviews conducted the discussions with mostly brigade or battalion logistics units, a few with Observer/Controllers (O/Cs) from Army training centers and several higher-level organizations. The

⁷⁸ CASCOM, “*Pre-Command Course BCS3 C2 Architecture Brief*,” (2008), Slide number 8, <https://www.cascom.army.mil/private/esd/BCS%20briefings%20page/Index.asp> (accessed 20 Feb 2009).

⁷⁹ DA, Battle Command Knowledge System (BCKS) Sustainment Knowledge Network (SKN), *Virtual Presentations*, <https://www.us.army.mil/suite/portal/index.jsp> (accessed 20 Jan 2009).

majority of the interviews were with units that had recently redeployed from the combat zone. Of the 15 organizations asked for feedback on BCS3, only three made positive remarks and only one of those making such remarks was from a logistical support unit. The other two incidents of positive remarks came from O/Cs supporting units conducting training at one of the Army's training centers. The other 12 organizations responded with a mix of negative reactions. Several simply replied that they did not use the BCS3. Some said that the BCS3 was too difficult to use or it was not intuitive enough. More than one thought the data was too latent for the system to be useful. Other comments referred to the loss of training proficiency over time due to the disparity between when their units conducted the new equipment training and when they needed to use that training in the combat zone.⁸⁰

If the units interviewed by CASCOM did not use the BCS3 or did not find it helpful for their mission, what did they use to battle command logistics? How did these commanders maintain adequate situational awareness on all aspects of logistics? It is not entirely clear. There are no open source documents describing in detail the logistics C2 processes used by BCTs and other combat units in OIF and OEF. Only a couple of the interviewees discussed how they conducted C2 of logistics, but the discussion was limited due to the nature of the question and the acceptance of a short answer. Some of the interviewees mentioned they used systems such as FBCB2 and MTS as their primary systems for logistics reporting. However, systems like FBCB2 and MTS are designed for specific communication purposes and not for providing commanders with comprehensive logistics situational awareness. As noted earlier, the BCS3 program manager has addressed some of the reasons for user non-acceptance such as ease of use with changes to the latest version of software. Results are not yet available to determine whether user acceptance will improve.

⁸⁰ Ibid.

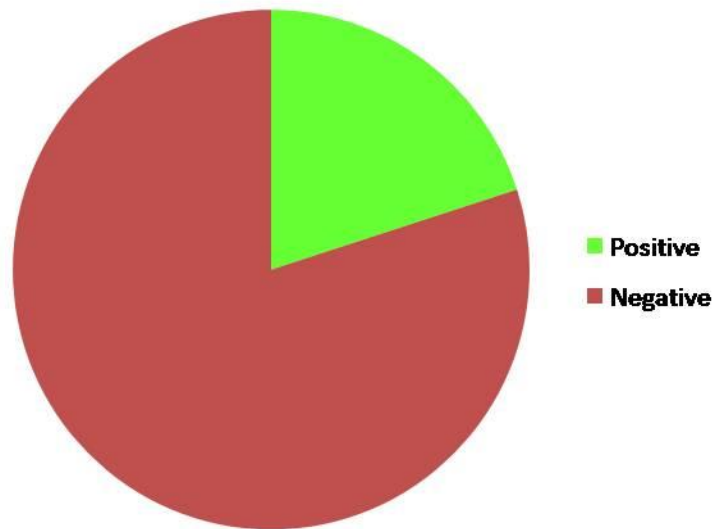


Figure 4: Post Deployment Interview Results⁸¹

In addition to the online interviews, an interview was conducted with Brigadier General Edward C. Cardon, Deputy Commandant of the Command & General Staff College and former Brigade Combat Team commander in OIF. When asked of his expectations of the BCS3 prior to deployment he responded, “I wanted BCS3 to perform the same role as CPOF does for the maneuver force. I wanted a complete integrated function. Not only would it be for all classes of supply, to include medical, to include ammunition, to be able to track supplies either through MTS, FBCB2 or RF Tags and also be able to help us with property accountability.”⁸² He went on to add, “I thought that if we could have that and have BCS3 be the integrator and as units move around you could tell exactly what people had, you wouldn’t have to ask all these questions on what’s the sustainment status of a unit? You would know.”⁸³ When asked about the effectiveness of BCS3 during deployment he responded, “we trained on it and it worked pretty well during train-ups, but it didn’t work at all in theater because of its inability to task organize. It became so

⁸¹ SKN, *Virtual Presentations*.

cumbersome to task organize that it was actually faster to use it as strictly just tracking things as opposed to a true logistics integration tool.”⁸⁴

A Civilian View of a Incorporating New Technology

The Army is not the only type organization that has challenges with user acceptance of new systems. Instituting new Information Systems (IS) can trouble Civilian companies as well. Jamal Ouadahi, a Canadian researcher studying IS acceptance, found evidence of poor acceptance rates. In a recent article, Mr. Ouadahi wrote, “Despite improvements in the success rate for IS adoptions in recent years, the success rate is still only about 30%.”⁸⁵ A study conducted just a few years earlier found “estimates suggest that nearly half of all new technology implemented in organizations fails.”⁸⁶ Because of the low acceptance rates of Information Technology (IT), human resources personnel study the behavior of employees during implementation. One central model used in the IT literature to examine user reactions to new systems is the Technology Acceptance Model (TAM).⁸⁷

⁸² BG Edward C. Cardon (2009), Interview by Thomas Sachariason, Fort Leavenworth, KS.

⁸³ Ibid

⁸⁴ Ibid, The task organization feature is key because it includes the Unit Identification Codes (UIC) of each unit. The UIC is the link to the STAMIS network and critical to the ability of BCS3 to populate accurate combat power reports.

⁸⁵ Jamal Ouadahi, “A Qualitative Analysis of Factors Associated with User Acceptance and Rejection of a New Workplace Information System in the Public Sector: A Conceptual Model,” Canadian Journal of Administrative Sciences, 25 (Sep 2008) 3, <http://lumen.cgsccarl.com/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=bth&AN=35062966&site=ehost-live> (accessed December 15, 2008).

⁸⁶ L. Aiman-Smith and S.G. Green, “Implementing New Manufacturing Technology: The Related Effects of Technology Characteristics and User Learning Activities,” Academy of Management Journal, 45 in Sandra Fisher and Ann Howell, “Beyond User Acceptance: An Examination of Employee Reactions to Information Technology Systems,” Human Resource Management, 43 (Summer/Fall 2004), 243-258, Wiley Periodicals, Inc. <http://www.interscience.wiley.com> (accessed 15 Jan 09).

⁸⁷ SA Brown, AP Massey, MM Montoya-Weiss and JR Burkman, “Do I really have to? User Acceptance of Mandated Technology,” *European Journal of Information Systems* (2002), 286,

In the TAM, the perceived ease of use of new technology and its usefulness are the basis for user acceptance of a new system. Researchers from the Kelley school of Business at Indiana University, the College of management at North Carolina State University and the College of Business Administration at Texas Tech University studying user acceptance of technology found, if users feel the system is easy to use and helps them accomplish their job tasks, they are more likely to accept and use it.⁸⁸ In other studies, user acceptance researchers found, “organizations wishing to foster positive employee attitudes toward a new system should focus on expounding the benefits of use (i.e., usefulness).⁸⁹ Civilian companies are spending potential profit dollars to study the acceptance and usefulness of new information systems. The Army can both take a cue from corporate investment ideas and potentially benefit from their research. The Army can also benefit from understanding what drove the acceptance of some of its successful systems.

Vignettes of Successful System Implementation

Like civilian information systems, military battle command systems can be difficult to implement into the workforce. The systems usually require extensive initial training and continual refresher training so that skills do not atrophy. The systems routinely require software and sometimes hardware upgrades leading to more delays in operations and usually more training. Regardless of these difficult challenges, some systems have been very successful in OIF. In this subsection, the monograph describes two systems that did very well and identifies a common link between the two that appears to be the causal factor for success. The first system is JDLM and the second is CPOF.

<http://lumen.cgscarl.com/login?url=http://proquest.umi.com.lumen.cgscarl.com/pqdweb?did=250369701&sid=2&Fmt=6&clientId=5094&RQT=309&VName=PQD> (accessed 13 Feb 09).

⁸⁸ Brown, Massey, Montoya-Weiss and Burkman, 245.

⁸⁹ Ibid, 293.

As previously mentioned, the Joint Deployment Logistics Model was the situational awareness tool for logistics during the initial phases of OIF. The JDLM was the system that provided the Logistics Common Operating Picture (LCOP). BG Charles Fletcher was the 3d Corps Support Command (COSCOM) commanding general for the initial phases and was the driving force behind the employment of the system.⁹⁰ The 3d COSCOM had four Corps Support Groups (CSG) in its task organization during the initial stages of OIF I, the 7th and 16th CSGs from Germany, the 24th CSG from Fort Stewart, GA and the 371st CSG of the Ohio Army National Guard.⁹¹ Each of the CSGs was provided the JDLM software and some initial training in Kuwait.

To facilitate better tracking of the transportation assets, teams in Kuwait installed satellite transceivers on hundreds of line haul trucks. The transceivers were a mixture of Defense Transportation and Control System (DTRACS) and Movement Tracking System (MTS).⁹² Once installed, the movement of the vehicles fitted with both of the satellite-based communications systems was visible on the LCOP through JDLM. This capability provided BG Fletcher situational awareness on convoys travelling on the lines of communication (LOC) back and forth from Kuwait to Iraq. The JDLM also provided the capability to track parts moving in the

⁹⁰ Laurence Lessard, “Operational Leadership Experiences, Interview with MAJ Tom Sachariason,” *Combined Arms Research Library* (Fort Leavenworth, KS: Combat Studies Institute, 26 Mar 2008), 4, http://cgsc.cdmhost.com/cdm4/item_viewer.php?CISOROOT=/p4013coll13&CISOPTR=1138&CISOBX=1&REC=6 (accessed 15 Jan 09).

⁹¹ Donald Wright and Timothy Reese, *On Point II* (Fort Leavenworth, KS: CSI Press, 2008) 498-499.

⁹² Eric Peltz, John Halliday, Marc Robbins and Kenneth Girardini, “Sustainment of Army Forces in Operation Iraqi Freedom: Battlefield Logistics and Effects on Operations,” (Rand Corporation, 2005), 28, http://www.rand.org/pubs/monographs/2006/RAND_MG344.pdf (accessed 5 Jan 09).

transportation system from Army depots in CONUS to Iraq using RFID tags.⁹³ “These tags go on supply containers and act like the bar-coded items on grocery store shelves.”⁹⁴ David Mills, principal deputy for logistics at the Army Materiel Command said in a 1998 interview, “Five or six years ago our problem was knowing where the container is... Now it’s what’s in it and who’s supposed to get it.”⁹⁵ This situational awareness allowed commanders and staffs the ability to see where their items were in the transportation system instilling more trust and presumably preventing them from re-ordering supplies.

BG Fletcher mandated the use of the JDLM in the COSCOM and although it was a new system for many of the units, the training level slowly improved and the units became proficient. Mandating its use forced a change in the leadership culture to trust the technology, exploit its capabilities and adapt its battle command processes. Similar to how Eisenhower and Patton saw the efficacy of the tank and its potential contributions to maneuver warfare, BG Fletcher understood how the technology could revolutionize the C2 of logistics.⁹⁶ In order to provide the capability to the force, BG Fletcher had to show the warfighters how the system would assist them in the C2 of their logistical assets. To assist in gaining support of the maneuver units, BG Fletcher provided system overview briefings to LTG Wallace, the V Corps Commanding General

⁹³ The Army uses RFID technology by burning logistics data onto a radio frequency tag and then securing that tag to the equipment to allow intransit visibility (ITV). The tags emit a radio signal that transfers to ground based radio frequency interrogators when the tag passes in close proximity. The interrogators transfer the data to the ITV network servers allowing software such as the JDLM to access it and track the shipments. See Savi Technology, Case Study: Operation ENDURING FREEDOM/Operation IRAQI FREEDOM, <http://www.m2mpremier.com/UploadFiles/Savi%20Technology3.pdf>

⁹⁴ John Rhea, “Army Logistics Enters the COTS Age,” *Military & Aerospace Electronics* (July, 1998), http://mae.pennnet.com/articles/article_display.cfm?Section=ARCHI&C=Feat&ARTICLE_ID=72307&KEYWORDS=Fort+Monmouth&p=32 (accessed 13 Feb 09).

⁹⁵ Ibid.

and the Assistant Division Commanders for Support (ADC-S) from the 3d Infantry Division (ID), 4th ID, and 101st ABN DIV. His persistence in demonstrating the system's value won its approval and shortly thereafter, each of the commands had the JDLM system with trained operators in the headquarters.⁹⁷

During OIF, the different headquarters organizations that transitioned at the corps and division levels touted different command and control systems such as MCS, C2PC and FusionNet and the systems fluctuated in significance and use as often as the unit headquarters rotated in and out of the theater. When V Corps was in theater the main system for the COP was C2PC. Due to initial success in OEF with the 82d Airborne Division, the XVIII ABN Corps chose FusionNet for the COP when it was the lead for MNC-I.⁹⁸ After the Chief of Staff's edict on top-down approval of systems in 2004, there has been much less shifting of systems. The one system that was allowed by the Chief of Staff during this period was the Command Post of the Future (CPOF).⁹⁹ MG Chiarelli, the 1st Cavalry Division CG, worked with the Defense Advanced Research Projects Agency (DARPA) to develop a better COP. After success in training exercises, he requested and received approval to adopt the use of CPOF during the division's OIF rotation in 2004-2005. During the 1st Cavalry's rotation, MG Chiarelli was adamant about implementing the new technology. "General Chiarelli insisted upon its use. If it was not on CPOF, then Chiarelli

⁹⁶ John Eisenhower, *Yanks: The Epic Story of the American Army in World War I*, (New York: Simon & Schuster, 2002), Excerpt, http://www.worldwar1.com/dbc/j_eisen.htm (accessed 18 Feb 09).

⁹⁷ Laurence Lessard, pg. 8

⁹⁸ Carol A. Wortman, "*Inefficient Battle Command Results from Unique Commanders Solutions*," (Carlisle Barracks, PA: Strategy Research Project), <http://stinet.dtic.mil/cgi-bin/GetTRDoc?AD=ADA479737&Location=U2&doc=GetTRDoc.pdf> (accessed 15 Dec 08).

⁹⁹ David S. Alberts and Richard E. Hayes, "*Planning Complex Endeavors*," (Washington, DC: CCRP, 2007), 66, http://www.dodccrp.org/html4/books_downloads.html (accessed 17 Feb 09).

was not interested in hearing about it.”¹⁰⁰ The system proved reliable for the 1st CAV and when LTG Chiarelli was promoted and deployed again as the commanding general for Multi-National Corps Iraq (MNC-I), he demanded the subordinate divisions, the COSCOM and separate brigades brief him nightly using CPOF. There were initial challenges of user acceptance, but his insistence created expertise in the operators and drove system improvements in the software.¹⁰¹ The CPOF became an Army program of record within the ABCS in 2006 and is the primary system used for the COP in OIF.¹⁰² Both of these vignettes demonstrate the effectiveness of a strategic sponsor’s persistence in mandating the use of new technology.

In summary, it is clear that the BCS3 is a highly capable system and that the Army believes there is promise and potential in the BCS3 due to the investment of both budget dollars and training requirements. Regardless of the investment, results show user acceptance of this information system is low. Feedback from Army units redeployed from combat also demonstrates they were not required to use the system. However, a conclusion for why the BCS3 has not been fully accepted cannot be drawn directly from the lack of a mandate, but the vignettes of successful systems show commitment to the system and a mandate by the commander provides more positive results.

¹⁰⁰ Caroline Croser, “*Organising Complexity: Modes of Behavior in a Networked Battlespace*,” *Land Warfare Studies Centre Working Papers*, (Australia:, 2007) 41, http://www.defence.gov.au/army/lwsc/docs/WP_133.pdf (accessed 12 Jan 09).

¹⁰¹ David Carr, “Gen. Chiarelli on new IT: Handle with care,” *Government Computer News* (DEC, 2008), <http://gcn.com/Articles/2008/12/03/Gen-Chiarelli-on-new-IT-Handle-with-care.aspx?Page=2&p=1> (accessed 18 Feb 09).

¹⁰² Giles Ebbutt, “*Future Command Post Comes of Age Under US ABCS*,” *International Defence Review* (Jane’s Information Group, NOV, 2007), [http://search.janes.com.lumen.cgscarl.com/Search/documentView.do?docId=/content1/janesdat/mags/idr/history/idr2007/idr10955.htm@current&pageSelected=allJanes&keyword=Command%20Post%20of%20the%20Future%20\(CPOF\)&backPath=http://search.janes.com.lumen.cgscarl.com/Search&Prod_Name=IDR&](http://search.janes.com.lumen.cgscarl.com/Search/documentView.do?docId=/content1/janesdat/mags/idr/history/idr2007/idr10955.htm@current&pageSelected=allJanes&keyword=Command%20Post%20of%20the%20Future%20(CPOF)&backPath=http://search.janes.com.lumen.cgscarl.com/Search&Prod_Name=IDR&) (accessed 20 Feb 09).

Conclusion

In conclusion, the BCS3, the logistics core element of the ABCS, is important because commanders critically need the logistical status of their forces included in their COP. The BCS3 provides the critical tools commanders need to C2 their logistics, but many units, as well as BG Cardon found the BCS3 lacking and chose not to use the system. Of the units with experience using the system, respondents provided feedback that the BCS3 was too difficult to use or was not intuitive enough to suit their operations. BG Cardon did not see the system as useful at the BCT level because under combat conditions it did not integrate all the logistics functions adequately to meet his needs. The Army is funding the BCS3 program at a cost of tens of millions per year and the implementation of the program results in thousands of mandatory training hours conducted across the force. Viewed independently, these costs are not a significant percentage of the Army budget or training environment, but given they exist at a time of increased budget concerns and constricted ARFORGEN process, they demand close scrutiny.

Commanders need a logistics system that supports logistics reporting, convoy operations, RSO&I, commodity tracking and provides a logistics common operating picture. They need a logistics system that plays the integrative role that CPOF does for the maneuver force. A system that accesses the data for all classes of supply, the medical information, all property accountability information, etc. and links it together to provide commanders accurate, near- real time answers on logistics. Although currently, there are significant shortfalls in capability, the BCS3 remains the optimum solution to provide commanders the ability to command and control their logistics. No other system combines the capabilities BCS3 provides and with continued improvements the usefulness will increase.

The current system of choice within the ABCS for the COP, CPOF, is a highly capable system, but it cannot provide commanders the information on logistics without the BCS3. The CPOF integrates the information from the core elements of ABCS, provides commanders the ability to collaborate with subordinates, and provides planners the ability to share information

with other planners. The CPOF does not receive logistics information directly from Army STAMIS so, without the BCS3, CPOF operators would have to manually create logistics information wasting time and energy. The leadership of the Army must ensure the system effectively provides commanders the tools they need and that those tools work in rigorous combat conditions. Both leaders in the vignettes of successful systems mandated the use of the system they advocated for and those mandates forced the subordinates to become familiar with the systems and identify and raise comments on the shortfalls. Their example demonstrates a technique that could be applied towards BCS3 to help improve its performance.

The BCS3 performance in the combat zone, viewed from the users, cannot receive a passing grade. Units are not using the system and things need to change. The DOTMLPF process developed a system that has great capabilities, but it has failed to produce an effective logistics system that Army units will find useful. The BCS3 does not have a strategic sponsor advocating for the system and demanding its use. Units comply with receipt of the system's hardware and software and the mandatory training requirements, but they do not comply with using the system for what it is designed because it is too difficult, too time consuming or simply does not do what it promises. In the end, the Army has a capable battle command system for logistics, but it has not applied the DOTMLPF process appropriately so that the system encompasses all the requirements of ensuring the system is value added to commanders in the field. When the assessment identifies what must be fixed and the design correlates into a system that the users will find more useful, the BCS3 will gain more user acceptance. Therefore, leadership in the form of a strategic sponsor and a thorough assessment to fix the problems is mandatory to improve the Army's battle command system for logistics.

Recommendations

The fundamental requirement necessary to create successful changes in the BCS3 system is to reexamine and make appropriate changes to elements of DOTMLPF. Doctrine adequately

explains battle command and the tools available to enhance it. The organization transformed to meet the needs of the COE. Although there is some evidence for an argument regarding the funding of additional BCS3 Field Service Engineers, there are no significant personnel or facilities issues. The fielding of the BCS3 across the force is nearly complete, but the feedback from the force demonstrates low acceptance. Although the sample size is small, the results warrant an examination to assess the underlying causes of the lack of usage and an effort to lead, educate, train and provide proper materiel to the force.

Leadership

The Army needs to ascertain the specific reasons why user acceptance of the BCS3 is low and commanders are not mandating its use. Leadership is the key. The vignettes of COTS systems demonstrated successful implementation of new information systems. Mandating the use of the systems by the commander was the common element in both situations. Requiring the use of the system provides a couple crucial benefits. First, there is increased motivation for subordinates to familiarize themselves with the system. Secondly, subordinates are more motivated to recommend improvements to the system. Demanding the use of the system will also influence positive changes to education, training and materiel.

In essence, the BCS3 needs a strategic sponsor like MG Chiarelli was for CPOF and BG Fletcher was for JDLM. The primary difference between then and now is when those strategic sponsors were committed to the use of the systems, the specific systems were not yet programs of record – they were still just COTS that both felt could significantly contribute to mission accomplishment better than existing Army equipment. Ultimately, since the BCS3 is a logistics system, the task falls to the CASCOM commander to emphasize the use of the system and ensure that Army commanders are informed on its capabilities.

CASCOM should create a plan to fully assess new commander's awareness of the BCS3 and provide training to those who need it. Additionally, the plan must include the deployment of

teams to major training exercises and deployed locations to assess the user acceptance of the BCS3 and gain knowledge on software issues at the operator level.

Education

The education process at the enlisted and company-grade-officer level adequately integrates the BCS3.¹⁰³ The problem is the focus of the learning process at that level is on operating the system, not employing the system. Field grade staff officers and commanders lead the battle command process and that is where the education system is failing. Majors attending Intermediate Level Education do not learn anything about the BCS3 unless they request it as an elective. However, there is little incentive to choose it as an elective because their operational experience taught them they would not use it at their units. The ILE curriculum must adapt to instruct all majors on how the BCS3 is a value added tool in the battle command process. The curriculum should not only include orientation to the BCS3 software, but should also integrate the use of the system during exercises. For example, the curriculum already includes a logistics test and exercise. This would be a perfect opportunity to integrate the use of the BCS3 to incorporate its capabilities and familiarize the students with its functions. All majors should be instructed on the BCS3 and become familiar with its capabilities, but logisticians should be experts.

For a logistics battle command system to be successful the Army needs intelligent and competent multifunctional logistics leaders at all echelons to integrate the system into the battle rhythms of their organizations; educate subordinates, peers and seniors on the science of logistics; and then it needs to become the standard across the Army so Soldiers and organizations become proficient. Company grade officers are receiving training on the BCS3 in Army institutions, but

¹⁰³ DA, Army Training and Requirements Resource System (ATRRS), Transportation Captains Career Course, Course number: 8-55-C23, <https://atrrs.army.mil/atrrscc/courseInfo.aspx?fy=2009&sch=551&crs=8-55-C23&crstitle=TRANSPORTATION+CAPTAINS+CAREER&phase=2>

their training level atrophies as they are assigned to operational units where commanders do not mandate its use. Logistics officers must be the sponsor of the system at their level. If they are proficient in their branch and they understand the capabilities of the BCS3, they will be a more powerful asset to their organizations. When the commander demands the use of the BCS3, the logisticians in the organization must be prepared to execute.

Training

The Army declared the BCS3 as its network-enabled logistics information system and core element for logistics within the ABCS, but training systems and enablers have not fully caught up. Some of the feedback from the interviews demonstrated the BCS3 did not work in training or was not available during pre-deployment training exercises.¹⁰⁴ The BCS3 must be used in garrison, incorporated into home station training and tested in Warfighter exercises (WFX).

Commanders must have a vision for how they will battle command logistics in the garrison environment so they can hone their skills and their logisticians can remain competent on the system. The Army's training and leader development regulation stated, "The goal of Army training development is to ensure mission-focused training through the identification and training of critical collective and individual tasks, and supporting skills and knowledge."¹⁰⁵ Leaders must demand a review of how the BCS3 can support daily operations during non-deployed periods and creatively design ways to do so when they might not be readily apparent. Support operations officers can train their section's operators by making each section responsible for creating an OPVIEW that provides information specific to their area. For example, the Supply and Services section can create an OPVIEW that shows the status of all critical parts for the brigade with map

¹⁰⁴ SKN, Virtual Presentations.

¹⁰⁵ Headquarters, Department of the Army (DA), *AR 350-1: Army Training and Leader Development* (Washington, D.C.: Department of the Army, 2007), Appendix B, 104.

icons depicting where parts were shipped from and the trail they are taking en route to the requesting organizations. The Maintenance Section can create the slant report and ensure it accurately shows the commander the equipment status of the brigade. The creation of helpful OPVIEWS is only limited by the imagination of the operators and the direction by the leaders.

One of the principles of training is the Army is a “train as you will fight” organization so it must fully integrate the BCS3 in the training cycle more than simply conducting the NET during the ARFORGEN process.¹⁰⁶ Once the BCS3 is fully issued to all Army organizations there will no longer be a NET prior to units deploying. Organizations must integrate the BCS3 into their training plans and those plans must stress the cognitive approach to using battle command systems. Using the BCS3 for garrison activities will keep operators proficient, but then those skills must be tested in command post and field training exercises. The training exercises nearly always include a setup of the unit’s field Tactical Operations Center (TOC). The TOC setup provides training for the S6 personnel in ensuring all the systems have connectivity and are working properly, but more importantly, the battle tracking of the deployment to the field site and field sustainment operations provides the commanders, operators and staff with necessary training on proper employment of the system.

Finally, the BCS3 must be included in the unit’s capstone training event such as its pre-deployment WFX at one of the Army’s Combat Training Centers. These events typically include simulation exercises designed to employ the ABCS and make the training environment as close to potential battlefield operating conditions as possible. The interviewees indicated some units used the BCS3 and others had difficulty due to training deficiencies or problems with the BCS3 not integrating into the simulation smoothly.¹⁰⁷ Without fully integrating the BCS3 into these events

¹⁰⁶ Headquarters, Department of the Army (DA), *FM 7-0: Training for Full Spectrum Operations* (Washington, D.C.: Department of the Army, 2008), II-2-5.

¹⁰⁷ SKN, Virtual Presentations

units will not have the incentive to train on the system prior to the exercise and therefore, will not be capable of using the system once deployed. The WFX is a perfect opportunity for the Army to assess the usefulness and acceptance of the BCS3 and make appropriate changes.

Materiel

Civilian research found low acceptance rates when the users did not find new systems useful. The Army must examine the usefulness of the system and make whatever software changes are necessary to make the tool more intuitive, easier to use and more capable at each echelon. One thing the Army should avoid is a lack of innovation now that the BCS3 is a program of record. Technology is rapidly advancing and the BCS3 needs to continue to adapt to meet the needs of the organizations that employ it. In discussing the bureaucratic difficulties of improving technological solutions to the battlefield recently at the NCW conference hosted by the IDGA, The Vice Chief of Staff of the Army, General Chiarelli stated, "We must... ensure that we're using the knowledge and information that's available through advances in technology as effectively as possible. After all, 'Knowledge is power.'¹⁰⁸ The Army fielded a new BCS3 software version in the Fall of 2008 to units preparing to deploy in 2009. The Army must resource a critical examination of the software during the organization's training and deployment to assess user acceptance. As mentioned above, assessment teams have a captive audience at unit capstone exercises, but leaders can also direct assessment other ways. CASCOM should develop a comprehensive plan to gather feedback from tactical organizations and then turn those lessons learned into system improvements.

Additional research on the acceptance of the BCS3 and its usefulness is necessary to fully identify all the reasons the BCS3 has not received universal acceptance throughout the Army. The

decisions to fund and field the program are in the past. Now is the time to do what is necessary to maximize its return.

¹⁰⁸General Peter Chiarelli, Speech at Net-Centric Warfare Conference hosted by the Institute for Defense and General Advancement, January 28, 2009, <http://www.army.mil/-speeches/2009/02/17/16993-gen-chiarelli-idga-nwc-2009-conference-remarks---january-28-2009/>

BIBLIOGRAPHY

Books

- Alberts, David S. and Hayes, Richard E. *Power to the Edge: Command and Control in the Information Age*, Washington, DC : CCRP Publication Series, 2003.
- Atkinson, Anthony A., Banker, Rajiv D., Kaplan, Robert S. and Young, S. Mark, *Management Accounting*, Second Edition New Jersey: Prentice-Hall, Inc. 2007.
- Axelrod, Robert and Cohen, Michael D. *Harnessing Complexity: Organizational Implications of a Scientific Frontier*, New York: Basic Books, 2000.
- Endsley, Mica R. "Situation Awareness: A Key Cognitive Factor in Effectiveness of Battle Command," In *Battle of Cognition: The Future Information-rich Warfare and the Mind of the Commander*, edited by Alexander Kott, 95-119. Westport, CT: Praeger Security International, 2008.
- Foley, Robert "OIF Study Group Operational Summary: Information Operations," 15 July 2003, quoted in On Point I, pg. 149-150
- Fontenot, Gregory, Degen, E. J., and Tohn, David. *On Point: The United States Army in Operation IRAQI FREEDOM*. Fort Leavenworth: Combat Studies Institute Press, 2004
- Paret, Peter, ed. *Makers of Modern Strategy: From Machiavelli to the Nuclear Age*, Princeton: Princeton University Press, 1986.
- Sinnreich, Richard. "Variables and Constants: How the Battle Command of Tomorrow Will Differ (or Not) from Today's." In *Battle of Cognition: The Future Information-rich Warfare and the Mind of the Commander*, edited by Alexander Kott, 10-36. Westport, CT: Praeger Security International, 2008.
- Turabian, Kate L. *A Manual for Writers of Term Papers, Theses, and Dissertations*. 7th ed. Chicago: University of Chicago Press, 2007
- Wright, Donald P. and Timothy R. Reese. *On point II: Transition to the new campaign*. Fort Leavenworth: Combat Studies Institute Press, 2008.

Military and Government Publications

- Alberts, David S. and Hayes, Richard E. "Planning Complex Endeavors," *Command and Control Research Program*, 2007, http://www.dodccrp.org/html4/books_downloads.html (accessed February 17, 2009).
- Casey, George W. Jr. "Prepared Statement of General George W. Casey Jr. Chief of Staff of the Army before the House Armed Services Committee," September 26, 2007, http://armedservices.house.gov/pdfs/FC092607/Casey_Testimony092607.pdf (accessed 15 Jan 09).
- U.S. Combined Arms Support Command (CASCOM), "Pre-Command Course BCS3 C2 Architecture Brief," July, 2008, <https://www.cascom.army.mil/private/esd/BCS%20briefings%20page/Index.asp> (accessed 20 Feb 2009).
- . "DOTMLPF Assessment of BCS3" October, 2005, <https://www.cascom.lee.army.mil/private/esd/bcs3/index.asp?dir=DATA\DOTMLPF> (accessed 7 Dec 08).

- _____. "BCS3 Executive Overview," February 4, 2009,
<https://www.cascom.army.mil/private/esd/BCS%20briefings%20page/Index.asp>
(accessed 20 Feb 2009).
- _____. "CSS Pre-Command Course," Jul, 2008,
<https://www.cascom.army.mil/private/esd/BCS%20briefings%20page/Index.asp>
(accessed 20 Feb 2009).
- _____. *FY 09-10 Functional Requirements Document (BCS3)*, Fort Belvoir, VA., March 17, 2008, <https://www.us.army.mil/suite/doc/12480934> (accessed January 10, 2009).
- _____. *Global Command and Control System - Army*, Fort Lee, VA., April 9, 2007,
https://www.cascom.lee.army.mil/private/esd/GCSS-A/Briefing/GCSS-Army_Overview9April2007.ppt (accessed February 10, 2009).
- U.S. Department of the Army. *The Way Ahead: Our Army at War, Relevant and Ready*, " Washington, DC.: U.S. Government Printing Office, November 23, 2003.
<http://www.army.mil/thewayahead/relevant.html> (accessed 15 Jan 09).
- _____. *Additional Modernization Initiatives in Focused Logistics, Army Modernization Strategy 2008*, Washington, DC: 2008, <http://www.army.mil/institution/leaders/modplan/> (accessed 15 Feb 09).
- _____. *Army Regulation (AR) 350-1, Army Training and Leader Development*, Washington, DC. 2007.
- _____. *Army Training and Requirements Resource System (ATRRS), Transportation Captains Career Course*, Course number: 8-55-C23,
<https://atrrs.army.mil/atrrsc/courseInfo.aspx?fy=2009&sch=551&crs=8-55-C23&crstitle=TRANSPORTATION+CAPTAINS+CAREER&phase=2> (accessed February 20, 2009).
- _____. *Army Vision 2010* (1996), <http://www.army.mil/2010/> (accessed 15 Jan 09).
- _____. *Battle Command Knowledge System (BCKS), Sustainment Knowledge Network (SKN), Virtual Presentations*, <https://www.us.army.mil/suite/portal/index.jsp> (accessed 20 Jan 2009).
- _____. *Battle Command Knowledge System (BCKS), SKN, Commander Interview, COL Mark Barbosa*, by LTC Tony Skubi
<https://forums.bcks.army.mil/secure/CommunityBrowser.aspx?id=720448&lang=en-US> (accessed 5 Feb 09).
- _____. *Field Manual, (FM) 1, The Army*, Washington, DC. 2005.
- _____. *FM 3-0, Operations*, 2008.
- _____. *FM 3-0, Operations*, 2001.
- _____. *FM 6-0, Mission Command*, 2003.
- _____. *FM 7-0, Training for Full Spectrum Operations*, 2008.
- _____. *FM 100-17-3, Reception, Staging, Onward Movement, and Integration*, 1999.
- _____. *Field Manual Interim (FMI) 3-0.1, The Modular Force*, 2008.
- _____. *Posture Statement, Addendum E: Army Forces Generation (ARFORGEN) Process*, 2008,
http://www.army.mil/aps/08/addenda/addenda_e.html (accessed January 15, 2009).

- _____. Procurement Programs, “*Tactical C2 Systems, BCS3*,” February, 2007, <http://d.scribd.com/docs/1nd8saqhbxyh3eblgk2q.pdf> (accessed January 27, 2009).
- _____. Program Executive Office Command Control Communications Tactical (PEO-CT3), Fort Monmouth, NJ: 2009, http://peoc3t.monmouth.army.mil/connecting_systems/ConnectingSystems.html (accessed 21 Feb 09).
- _____. Research Development Training and Evaluation (RDT&E) Budget Item Justification (R2 Exhibit), *Combat Service Support Control System Evaluation and Analysis*, Washington, DC: February, 2008, <http://www.asafm.army.mil/budget/fybm/FY09/rforms/vol2.pdf> (accessed January 27, 2009).
- _____. *RDT&E Budget Item Justification (R-2 Exhibit) Combat Service Support Control System Evaluation and Analysis*, FY 2002 through FY 2006, <http://www.dtic.mil/descriptivesum/Y2004/Army/0603805A.pdf> (accessed January 27, 2009).
- _____. Training and Doctrine Command (TRADOC) Pamphlet 525-3-0, “*The Army in Joint Operations: The Army’s Future Force Capstone Concept 2015-2024*,” Fort Monroe, VA: 2008), Ver. 2. <http://www.tradoc.army.mil/tpubs/pams/p525-3-0.pdf> (accessed February 22, 2009).
- _____. *TRADOC Pamphlet 525-3-3, The U.S. Army Functional Concept for Battle Command 2015-2024*, Fort Monroe, VA: 2007, Ver. 1. <http://www.tradoc.army.mil/tpubs/pams/p525-3-3.pdf> (accessed February 22, 2009).
- _____. *TRADOC School of Advanced Military Studies Student Text, Art of Design*, Version 1.0, Fort Leavenworth, KS: September 24, 2008.
- _____. *TRADOC Programs Integration Office – Army Battle Command System (TPIO-ABCS), ABCS, Army Battle Command System Leader’s Reference Guide*, Fort Leavenworth, KS: February 12, 2002, Ver. 6.2, 1-1.
- U.S. Department of Defense, *Annual Defense Review*, Washington, DC.: U.S. Government Printing Office, 1999. <http://www.dod.mil/execsec/adr1999/index.html> (accessed January 23, 2009).
- _____. Chairman Joint Chiefs of Staff Instruction, (CJCSI) 3180.01, *Joint Requirements Oversight Council (JROC): Programmatic Processes for Joint Experimentation and Joint Resource Change Recommendations*, Washington, DC.: U.S. Government Printing Office, October 31, 2002, http://www.dtic.mil/cjcs_directives/cdata/unlimit/3180_01.pdf (accessed February 12, 2009).
- _____. *CJCSI 3170.01F, Joint Capabilities Integration and Development System*. May 1, 2007. http://www.dtic.mil/cjcs_directives/cdata/unlimit/3170_01.pdf (accessed February, 12 09).
- _____. *Integration of the DoD Decision Support System, Defense Acquisition Guidebook*, Washington, DC: 2004, <https://akss.dau.mil/dag/DoD5000.asp?view=document> (accessed February 12, 2009).
- _____. *Major Automated Information System Annual Report: Maneuver Control System (MCS)/Tactical Battle Command (TBC)*, Fort Monmouth, NJ: 2007 <https://acc.dau.mil/GetAttachment.aspx?id=198262&pname=file&aid=33360&lang=en-US> (accessed February 21, 2009).

_____. *Single Interface to the Force (SIF), Course Introduction and Overview*, BCS3 Documents Library, <https://sif.kc.us.army.mil/> (accessed 3 Feb 09).

US Joint Forces Command (JFCOM). *Joint Publication JP 1-0 - Doctrine for the Armed Forces of the United States*. Washington, DC: Joint Chiefs of Staff, 2007.

_____. *JP 4-0 - Joint Logistics*. 2008.

Keyner, Hugo, *Joint Capabilities Integration and Development System (JCIDS): Moving to a Capabilities-based Process*, PEO/SYSCOM Conference, December 3, 2003, [https://ucstcdom03.ahf.nmci.navy.mil/n6/a_webdoc01.nsf/3D0309DCAA2645FA852571F4007607F8/\\$File/JCIDS%20PEO%20SYSCOM%20Brief.pdf](https://ucstcdom03.ahf.nmci.navy.mil/n6/a_webdoc01.nsf/3D0309DCAA2645FA852571F4007607F8/$File/JCIDS%20PEO%20SYSCOM%20Brief.pdf) (accessed February 4, 09).

Lessard, Laurence, *Operational Leadership Experiences, Interview with MAJ Tom Sachariason, Combined Arms Research Library*, Fort Leavenworth, KS: Combat Studies Institute, March 26, 2008), http://cgsc.cdmhost.com/cdm4/item_viewer.php?CISOROOT=/p4013coll13&CISOPTR=1138&CISOBX=1&REC=6 (accessed January 15, 09).

Monographs

Burley, Kyle, “*Linking Strategic Mission Command to Operational Battle Command*,” *The Center for Strategic Leadership, USAWC*, Vol. 9, Iss. 4 (JUL/SEP, 2007), The Collins Center Update, [http://www.csl.army.mil/usacsl/Publications/Collins%20Center%20Update%20Vol%209%20Iss%204%20\(Fall%2007\).pdf](http://www.csl.army.mil/usacsl/Publications/Collins%20Center%20Update%20Vol%209%20Iss%204%20(Fall%2007).pdf) (accessed February 13, 09).

Cammons, Dave, Tisserand, John, Williams, Duane, Seise, Alan and Lindsay, Dough, “*Network Centric Warfare Case Study: U.S. V Corps and 3rd Infantry Division (Mechanized) During Operations Iraqi Freedom Combat Operations (MAR/APR 2003)*,” (Carlisle Barracks, PA: Center for Strategic Leadership, 2006), 37, <http://www.carlisle.army.mil/usacsl/Publications/NCWCSVol1.pdf> (accessed December 15, 2008).

Croser, Caroline, “*Organising Complexity: Modes of Behavior in a Networked Battlespace*,” *Land Warfare Studies Centre Working Papers*, (Australia:, 2007) 41, http://www.defence.gov.au/army/lwsc/docs/WP_133.pdf (accessed January 12, 2009).

Gabel, D. C., “*Rails to Oblivion: The Decline of Confederate Railroads in the Civil War*,” *Combat Studies Institute* (Fort Leavenworth, KS: 2002).

Moore, David M., “*Battle Command Software: Meeting the Commander’s Needs?*,” U.S. Army War College, 15 Mar 2006, <http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA449171&Location=U2&doc=GetTRDoc.pdf> (accessed October 10, 2008).

Shirley, Eric, “*Army Battlefield Distribution Through the Lens of OIF: Logical Failures and the Way Ahead*,” CGSC, SAMS AY 04-05, <http://cgsc.cdmhost.com/cgi-bin/showfile.exe?CISOROOT=/p4013coll13&CISOPTR=370&filename=371.pdf#search=%22JDL%22> (accessed December 7, 2008).

Sullivan, Gordon R. and Dubik, James M., “*Land Warfare in the 21st Century*,” Carlisle Barracks, PA: Strategic Studies Institute (February 1993). <http://www.strategicstudiesinstitute.army.mil/pdffiles/PUB247.pdf> (accessed January 10, 2009).

Wortman, Carol A., “*Inefficient Battle Command Results from Unique Commanders Solutions*,” (Carlisle Barracks, PA: Strategy Research Project), <http://stinet.dtic.mil/cgi-bin/GetTRDoc?AD=ADA479737&Location=U2&doc=GetTRDoc.pdf> (accessed December 15, 2008).

Internet Sources

- Aiman-Smith L. and Green S.G., “*Implementing New Manufacturing Technology: The Related Effects of Technology Characteristics and User Learning Activities*,” *Academy of Management Journal*, 45 in Sandra Fisher and Ann Howell, “*Beyond User Acceptance: An Examination of Employee Reactions to Information Technology Systems*,” *Human Resource Management*, 43 (Summer/Fall 2004), 243-258, Wiley Periodicals, Inc. <http://www.interscience.wiley.com> (accessed January 15, 2009).
- Brown, SA, Massey, AP, Montoya-Weiss, MM and Burkman, JR., “*Do I really have to? User Acceptance of Mandated Technology*,” *European Journal of Information Systems* (2002), 286, <http://lumen.cgsccarl.com/login?url=http://proquest.umi.com/lumen.cgsccarl.com/pqdweb?did=250369701&sid=2&Fmt=6&clientId=5094&RQT=309&VName=PQD> (accessed February 13, 2009).
- Carr, David, “*Gen. Chiarelli on new IT: Handle with care*,” *Government Computer News* (DEC, 2008), <http://gcn.com/Articles/2008/12/03/Gen-Chiarelli-on-new-IT-Handle-with-care.aspx?Page=2&p=1> (accessed February 18, 2009).
- Chiarelli, Peter, General, Speech at Net-Centric Warfare Conference hosted by the Institute for Defense and General Advancement, January 28, 2009, <http://www.army.mil/-speeches/2009/02/17/16993-gen-chiarelli-idga-nwc-2009-conference-remarks---january-28-2009/> (assessed March 12, 2009).
- Ebbutt, Giles. “*Future Command Post Comes of Age Under US ABCS*,” *International Defence Review* (Jane’s Information Group, NOV, 2007), [http://search.janes.com/lumen.cgsccarl.com/Search/documentView.do?docId=/content1/janesdata/mags/idr/history/idr2007/idr10955.htm@current&pageSelected=allJanes&keyword=Command%20Post%20of%20the%20Future%20\(CPOF\)&backPath=http://search.janes.com/lumen.cgsccarl.com/Search&Prod_Name=IDR&](http://search.janes.com/lumen.cgsccarl.com/Search/documentView.do?docId=/content1/janesdata/mags/idr/history/idr2007/idr10955.htm@current&pageSelected=allJanes&keyword=Command%20Post%20of%20the%20Future%20(CPOF)&backPath=http://search.janes.com/lumen.cgsccarl.com/Search&Prod_Name=IDR&) (accessed February 20, 2009).
- Eisenhower, John, *Yanks: The Epic Story of the American Army in World War I*, (New York: Simon & Schuster, 2002), Excerpt, http://www.worldwar1.com/dbc/j_eisen.htm (accessed February 16, 2009).
- General Dynamics C4 Systems, <http://www.gdc4s.com/content/detail.cfm?item=2a58f8e2-ef2b-4bb1-9251-42ee4961dd7f> (accessed February 16, 2009).
- Greene, Harold and Mendoza, Robert, “*Lessons Learned from Developing the ABCS 6.4 Solution*,” *Defense Acquisition Review Journal* (APR/JUL 2005), 201, <http://www.dau.mil/pubs/arq/2005arq/2005arq-39/Mendoza.pdf> (accessed January 10, 2009).
- Gilmore, Gerry J., “*Army to Develop Future Force Now, says Shinseki*,” *Army News Service*, (October 13, 1999), <http://www.fas.org/man/dod-101/army/unit/docs/a19991013shinvis.htm> (accessed January 15, 2009).
- Kennedy, Earl, “*Forging an Alliance: Army Transporters in Europe*,” *Army Logistician* (Sep/Oct 2000), <http://www.almc.army.mil/alogs/issues/SepOct00/MS603.htm> (accessed January 7, 2009).

- Kennedy, Harold, "Army Trying to Expedite Flow of Supplies to Troops," *National Defense*, (May, 2001), http://www.nationaldefensemagazine.org/archive/2001/May/Pages/Army_Trying4251.aspx (accessed December 7, 2008).
- Moore, Burt, "CSSCS Gets Thumbs-Up for Peacekeeping in Bosnia," *The Quartermaster Professional Bulletin* (Spring 1999), http://www.quartermaster.army.mil/oqmg/professional_bulletin/1999/spring1999/CSSCS%20in%20Bosnia.htm (accessed 15 Oct 08).
- Ouadahi, Jamal, "A Qualitative Analysis of Factors Associated with User Acceptance and Rejection of a New Workplace Information System in the Public Sector: A Conceptual Model," *Canadian Journal of Administrative Sciences*, 25 (Sep 2008), <http://lumen.cgsccarl.com/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=bth&AN=35062966&site=ehost-live> . (accessed December 15, 2008).
- Peltz, Eric, Halliday, John, Robbins, Marc and Girardini, Kenneth, "Sustainment of Army Forces in Operation Iraqi Freedom: Battlefield Logistics and Effects on Operations," (Rand Corporation, 2005), 28, http://www.rand.org/pubs/monographs/2006/RAND_MG344.pdf (accessed January 5, 2009).
- Rhea, John, "Army logistics enters the COTS age," *Military & Aerospace Electronics* (July, 1998), http://mae.pennnet.com/articles/article_display.cfm?Section=ARCHI&C=Feat&ARTICLE_ID=72307&KEYWORDS=Fort+Monmouth&p=32 (accessed February 13, 2009).
- Rochlin, Gene, *Trapped in the Net: The Unanticipated Consequences of Computerization* (Princeton: Princeton University Press, 1997), VIII, para. 27, <http://press.princeton.edu/books/rochlin/> (accessed February 18, 2009).
- Stewart, S. Eric, LTC, "BCS3: Getting the Most Out of a Strategic Sustainment Tool," *Army Logistician* (SEP-OCT, 2008), http://www.almc.army.mil/alog/issues/SepOct08/bcs3_stategic.html (accessed January 10, 2009).
- Swan, Brian, "USAREUR: On Point for Logistics Technology Transformation," *Army Logistician* (MAR-APR, 2006), http://www.almc.army.mil/alog/issues/MarApr06/pdf/mar_apr_06.pdf (accessed October 15, 2008).
- Sachariason, Thomas E., "Why BCS3 "Doesn't Work"", *Army Logistician* (NOV-DEC, 2007), http://www.almc.army.mil/ALOG/issues/NovDec07/bcs3_doesnt_work.html (accessed September 20, 2008).
- Savi Technology, Case Study: Operation ENDURING FREEDOM/Operation IRAQI FREEDOM, <http://www.m2mpremier.com/UploadFiles/Savi%20Technology3.pdf> (accessed February 7, 2009).
- Wilson, Johnnie W., Coburn, John G. and Brown, Daniel G., "Our Revolution in Military Logistics: Supporting the 21st Century Soldier," *Army Logistician* 31, Jan/Feb 1999, http://www.almc.army.mil/ALOG/issues/JanFeb99/1999jan_feb/artp3_99jf.pdf (accessed December 15, 2008).

Interview

Cardon, Edward C., "The Effectiveness of BCS3 from the Perspective of a Former Brigade Combat Team Commander." Interview by Thomas Sachariason. 10 April 2009. Fort Leavenworth, KS.